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ORIGINAL MEMOIRS.

TETANY FOLLOWING THYROIDECTOMY CURED BY THE SUBCUTANEOUS INJECTION OF PARATHYROID EMULSION.

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M. L. L., white, female, American, age fourteen years and four months, was sent to the Franklin Square Hospital, Baltimore, February 21, 1907, by Dr. A. E. F. Grempler, with diagnosis of goitre. The enlargement of the thyroid was noticed in June, 1906, but the growth did not increase very rapidly. For several weeks previous to the operation the patient had been frequently awakened at night by throbbing pain in her neck accompanied by a sensation of choking.

The operation (4.30 P.M., February 21, 1907) was not especially difficult. The tumor on the right side was about the size of an orange and was deeply seated and twisted from its normal plane. This was removed first and while I tried to leave the posterior capsule and to avoid the parathyroids, I felt uncertain of having succeeded, and remarked to my assistant that on the left side where the growth was smaller and its position normal I would be careful not to interfere with these bodies. In this it will be noticed from the pathological report, I was only partially successful, as part of one was removed on this side. The patient lost but little blood and was taken from the operating room at 5.10 P.M. Her pulse, 90 before and 104 after the operation, was strong and regular, and her temperature 37° C. She was making an apparently uninterrupted recovery until 8.00 A.M., February

25—eighty-eight hours after the operation, at which time her teeth became clinched. Shortly afterwards her hands became contracted and her feet affected (Talipes equinovarus), wrists flexed on forearms (full flexion) and forearms slightly flexed on arms (at right angles). Reflexes were not exaggerated, no elbow or wrist jerk. The patient's head was thrown back, teeth clinched but her face not distorted, her head, shoulders, buttocks and heels only touching the bed. There was a marked rise of temperature, 38.5° C. The patient says the first indication of the trouble was a stiff feeling around the mouth, and later a drawing up of her thumbs. Her hands became "drawn up" and her feet cramped, also a tingling pain seemed to radiate from her head and shoot over her body and limbs, but at no time was the pain severe. She had great difficulty in swallowing, due solely to inability to move her tongue freely, it being (as she expressed it) "stiff." The symptoms toward the last of the attack were alarming. The tetany was marked by distinct exacerbations much like tetanus. During these the pulse was rapid and weak and the respiration was greatly interfered with. At times she would not breathe for a considerable period and would appear to be in such imminent danger that artificial respiration was necessary.

Blood.—Hæmoglobin 85, red cells 2,500,000; leucocytes 12,000; polymorphonuclears 70 per cent., large 4 per cent., small 24 per cent.; eosinophiles 0.40 per cent., transitional 1 per cent., leucocytes counted 1000. This count was made when the contractions were most pronounced. Leucocytosis in this case must have been due in some way to the effect of the operation on the thyroid or parathyroids, as there was no infection.

The patient was ordered 0.192 Gm. of thyroid extract every three hours, beginning Sunday, February 25, at eleven o'clock A.M. Also every four hours she was given 0.0648 Gm. of parathyroid extract, but obtained no relief, in fact, the contractions were becoming more marked all the time. On Monday twenty-eight fresh beef parathyroids were secured. Six of these raw were forced into the patient's mouth and she succeeded in swallowing them. This was repeated on Tuesday morning and again on Tuesday night. The symptoms becoming more pronounced, on Tuesday night five of the glands were placed in 1:1000 solution of bichloride of mercury and allowed to soak about ten minutes. Observing strict asepsis the glands were cut into fine

pieces under physiological salt solution. These pieces were placed into a mortar and ground into a homogeneous mass, 400 c.c. of sterile salt solution being poured into the mortar. This was then filtered through sterile gauze and given as salt transfusion into the patient's breast at 10.00 P.M. At 1.30 A.M. on the following morning she was asleep and the contractions were becoming gradually less violent. They disappeared in her hands, arms and face by 10.00 A.M., and her lower extremities were nearly relaxed. Her temperature dropped from 38.5° C. at 8.00 P.M. on the 27th to 36.8° C. on the 28th. All contractions had disappeared by noon on the 28th, and it was impossible to cause them by pressure on the artery supplying the part. Tapping on the transverse branch of the facial nerve still caused fibrillar contraction, but this disappeared by the morning of March 1. Parathyroids were discontinued by mouth on the morning of the 28th and parathyroid and thyroid extracts were discontinued on the morning of March 1. There were no contractions between February 28 and March 2. At 3.45 P.M., Saturday, March 3, the patient developed a recurrent attack which lasted twenty minutes and involved only the face. This was succeeded by milder attacks which lasted until about 11.30 P.M., at which time she was given two parathyroids subcutaneously in 100 c.c. of salt solution. The attacks ceased almost immediately, and the patient has remained free from any symptoms of tetany up to the present time—more than a year after operation.

When this patient's condition became desperate and the use of the thyroid and parathyroid extracts and the feeding of the raw parathyroids proved entirely useless, I called up Dr. W. G. MacCallum of the Johns Hopkins Hospital whom I knew had been doing much experimental work on tetany, hoping to find some method of using the parathyroids by injection. He told me he had used an emulsion of the fresh glands in dogs many times with no ill effects and with good results, and urged that we try it on our patient. The emulsion was prepared and used at the hospital after his directions.

The pathological examination showed colloid degeneration of the thyroid, right gland much the larger, and on its posterior aspect were found one whole parathyroid and parts of two others. On the left gland which was smaller, part of one parathyroid was

found. Microscopic examination showed the parathyroids to be normal.

The important fact that this case has remained permanently well is probably due to the fact that the parathyroids were not all removed. The parts left were undoubtedly so damaged by the traumatism of the operation that their functions were suspended, but as they recovered, their normal work was resumed and possibly compensatory hypertrophy secured.

SINUS OF FIRST BRANCHIAL CLEFT.

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THE following case is reported because of the rarity of the condition and because it illustrates that a lateral fistula in the neck of congenital origin is not always of second branchial cleft origin.

Henry Goldberg, 21, Russian Jew; stableman. Was admitted to the first surgical division of the Roosevelt Hospital February 20, 1907, on account of a swelling of the neck with a small discharging sinus. During early childhood he had developed tuberculous glands on both sides of neck. These were operated upon, the wounds subsequently discharging pus for months. Last operation 11 years ago. Except for children's diseases, history otherwise negative.

History of Complaint.—Ever since a small child he has had a swelling on right side of neck. This caused no symptoms until 4 years ago when it increased in size and was opened just above the clavicle. Since that time there has always been a slight amount of discharge. At times the opening would close, the swelling reappear and become tender. Finally the closed sinus would re-open and relief of symptoms would follow the discharge of contents. When admitted, his general condition was fair. Head, chest, abdomen and extremities negative. Temperature, 98; pulse, 92; respiration, 24. There were stellate puckered scars on both sides of neck, in submaxillary triangles and along anterior margin of sternomastoid muscle. A diffuse, pear-shaped swelling filled the posterior triangle of the right side of the neck up to level of the angle of the jaw. The stem of the pear was upward and was continuous with a dense induration extending behind the sternomastoid at the level of the jaw and from here upwards along the anterior margin of the sternomastoid. Just above the clavicle, the outer margin of the sternomastoid, was a small opening from which exuded, on

pressure, a few drops of cloudy sticky fluid. The sinus was injected with bismuth in water and an X-ray plate taken. This plate (Fig. 1) showed a shadow extending upward, corresponding to the indurated area in shape and direction. Unfortunately the base of the skull is not on the plate.

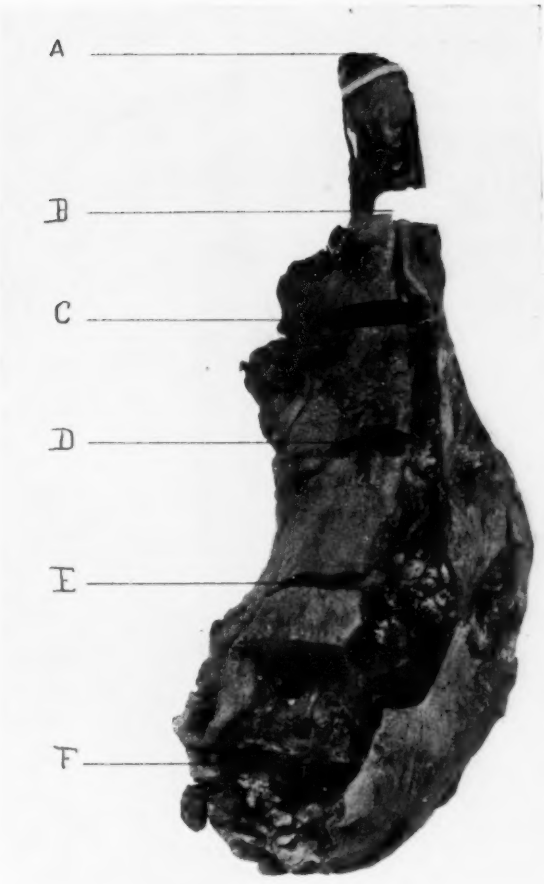
Operation.—Incision, the entire length of posterior margin of sternomastoid. The mass was found to have a well marked capsule which enabled easy separation from the sternomastoid, with which it was in intimate contact. At the level of the angle of the jaw the mass narrowed to a rounded strand about ½ inch in diameter. This passed upward and forward underneath the sternomastoid, and became smaller and firmer and about 1½ inch below the base of the skull it terminated in a cartilaginous column about ¼ inch in diameter. Throughout the entire length the mass could be shelled with comparative ease from the surrounding structures. The upper end was so firmly attached to the external auditory canal at the junction of the bony and cartilaginous portion, that in the process of removing the external canal was opened.

The relation to the surrounding structures of the neck was as follows: In the posterior triangle of the neck the mass lay beneath the deep cervical fascia with the exception of the sinus at the bottom. Anteriorly it was in contact with the posterior margin of the sternomastoid. Posteriorly and externally it was surrounded by the fat filling the posterior triangle and separating it from the trapezius and structures forming the floor of the triangle.

At the angle of the jaw where it passed forward and upward, underneath the sternomastoid muscle, it came in touch with the jugular vein. The upper portion passed beneath the occipital artery, left the jugular vein and was behind and to the outer side of the stylo-hyoid and stylo-pharyngeus. The last ½ inch was separated from the styloid process by a space just admitting the forefinger. The facial nerve did not come into the wound so that I am unable to state definitely its relation, but am of the opinion that the nerve crossed behind and to the outer side.

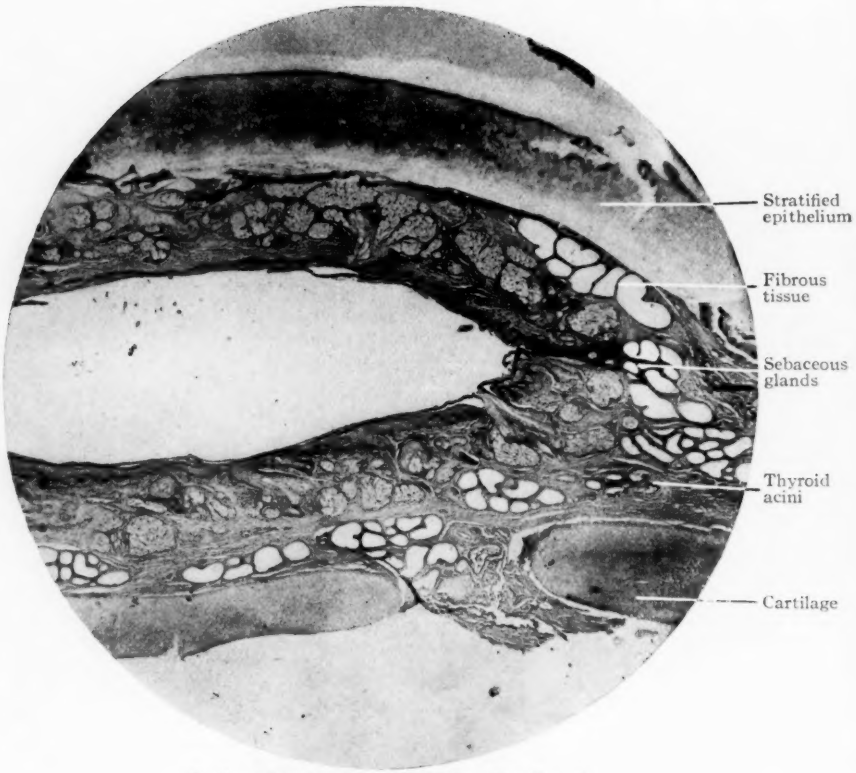
The wound healed by first intention, the patient leaving the hospital on the eighth day. The specimen was preserved in formalin and sections cut from the levels indicated in Fig. 2.

FIG. 1.



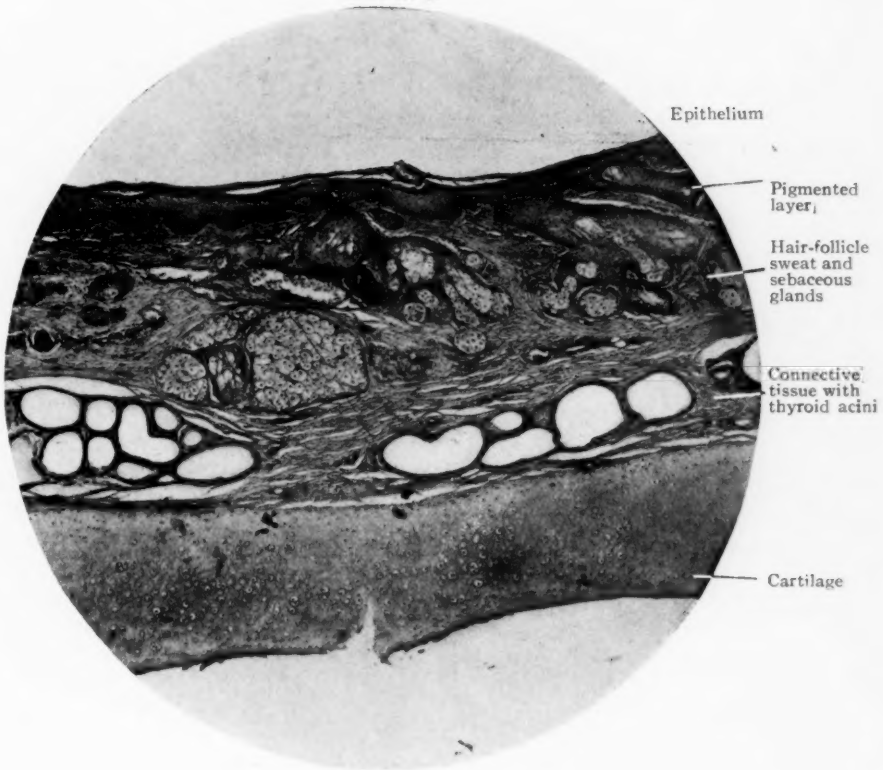
Photograph of specimen.

FIG. 2.



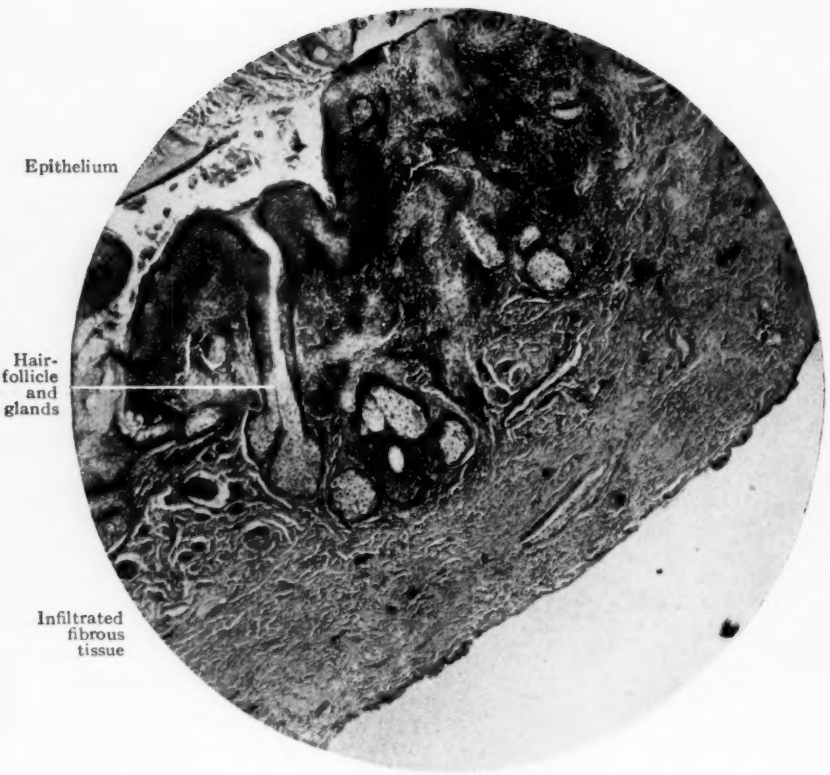
Section of entire cleft at level A. (See FIG. 1).

FIG. 3.



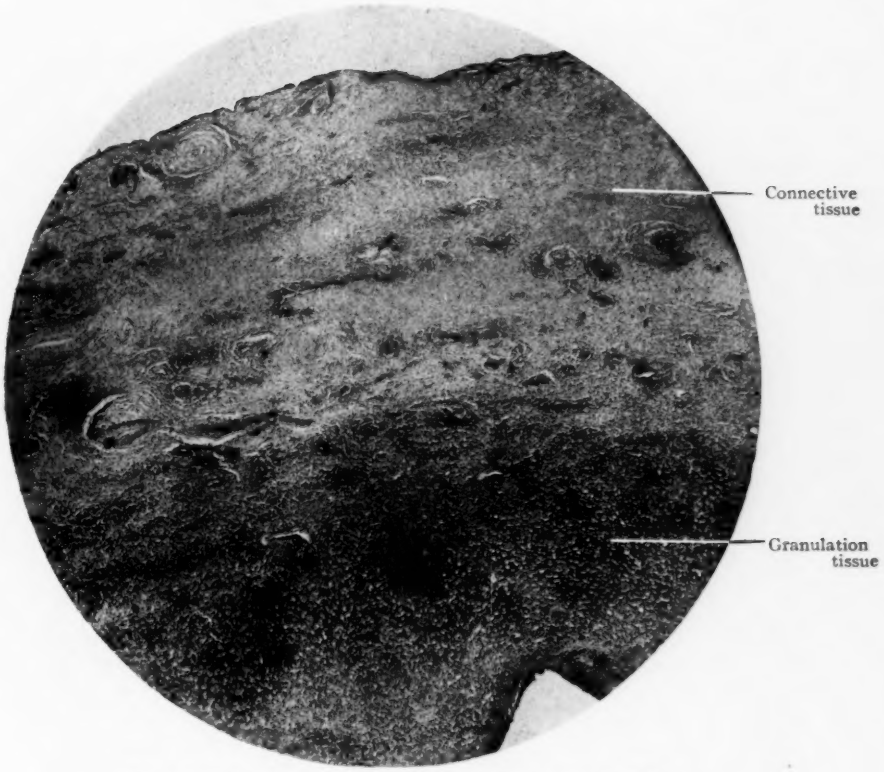
Enlargement of section shown in FIG. 2

FIG. 4.



Enlargement of section taken through secondary cyst at level B. (See FIG. 1).

FIG. 5.



Taken from lower levels. C, D, E, Fig. 1 present same conditions.

FIG. 6

Radiograph showing cavity of sinus injected with bismuth subnitrate.

The pathological report follows:

The cyst is a pear-shaped structure having a length of 12 cm. and a transverse diameter at the widest part of the cyst body of 4 cm. (Fig. 1.) The neck is 3 cm. long and has a diameter of 1 cm. at its upper end and 1½ cm. where it begins to widen out into the cyst body. The lumen of the upper end of the neck measures ½ cm., and about the circumference of this part there is a smooth plate of cartilage on one side and irregular cartilage formation on the other. Two centimeters below the opening of the cyst and leading off from the canal of the neck there is developed in the wall a secondary cyst cavity 1 cm. long.

SECTION *A*.—Made transversely across the upper end of the neck, shows the following structure from within out:

First.—A layer of stratified squamous epithelium identical with that found on the general skin surface, having the typical horny layer and epithelial cells. Two or three layers of the superficial epithelium lying immediately under the horny layer contains a large amount of black granular pigment.

Second.—Beneath the epithelium there is a thin margin of very dense fibrous connective tissue through which are scattered young fibrous tissue cells.

Third.—A zone of very large sebaceous glands which are so numerous and closely packed together as to form a distinct layer. A few very wide ducts can be seen running from these glands to the surface of the lumen through the epithelium. The glands are held together by very firm fibrous tissue. A few hair follicles are scattered through this gland layer.

Fourth.—A layer composed of thyroid gland tissue. The acini are very large and lined with low cuboidal epithelium which throughout contains a large amount of light yellow granular pigment. A few of the acini contain colloid.

Fifth.—A zone of normal cartilage which is represented by a single plate on one side and by three smaller plates on the opposite side of the wall. The cartilaginous plates are held together by very dense fibrous tissue.

SECTION *B*.—Made 2½ cm. below section *A* includes a section through the secondary cyst. This pouch is lined by stratified squamous epithelium, having a horny layer, beneath which are a few sebaceous glands and hair follicles. Around the epithelium and glands is a layer of very dense fibrous connective tissue extensively infiltrated by inflammatory round cells and leucocytes. The main canal in this section shows a lining of thick granulation tissue composed of young fibrous tissue cells, leucocytes and young blood vessels. Outside of this inflammatory layer the wall is composed of dense fibrous tissue infiltrated with young fibrous tissue and migrating inflammatory cells.

OTHER SECTIONS.—Taken at 4 cm. (C), 6 cm. (D), 8 cm. (E) and 12 cm. (F) from the neck of the cyst show a fibrous tissue wall lined by granulation tissue containing few squamous cells.

Points of Particular Interest.—First, lateral sinus of neck from first cleft; second, presence of thyroid tissue; third, relation to structures of second arch, the sinus being behind and underneath the upper portion of sternomastoid muscle.

TECHNIQUE OF EARLY OPERATION FOR THE REMOVAL OF TUBERCULAR CERVICAL LYMPH NODES.*

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In the removal of tubercular cervical lymph nodes thoroughness is surely very important. All infected nodes should be removed, when practicable, for, although the encapsulation of a limited infection is possible, its spread to other tissues is much more probable. The effort to procure thoroughness in this operation has frequently led to an utter disregard of the scars which are produced, and patients are frequently deterred from operation through fear of the resulting disfigurement. In certain cases of advanced and general cervical tuberculosis this disregard of resulting scars is to be advocated. It is better to save life and leave scars than to sacrifice the patient.

In other instances, however, a scar-saving operation is compatible with thoroughness. The infection in about 85 per cent. of the cases as they appear in New York first involves the subparotid group of lymph nodes; the nodes which form the first barrier to the spread of infection from the pharynx and tonsillar region. There is a characteristic appearance to the patients during the early part of this infection. The accompanying photograph (Fig. 1) indicates this appearance. The nodes just below and behind the angle of the jaw and under the upper part of the sterno-cleido-mastoid muscle are enlarged, slightly movable, rather tense, and usually free from evidence of acute inflammation. They frequently remain in this condition for several months, sometimes increasing and again

* Read before the Surgical Section of the New York Academy of Medicine, February 7, 1908.

diminishing in size; and during this period they may usually be thoroughly removed through a transverse incision, which is about two and a half inches in length, which lies in, or parallel to, the folds of the neck and which, after healing, is hardly to be seen.

The arrangement of the infected nodes in these early cases is almost uniform, and the technique of their removal is as definite as that of the average surgical procedure. The writer ventures to give diagrams showing the stages in an operation which he has found very useful in many cases, hoping in this way to promote early operations for these patients. These diagrams are photographs taken during the operation on the child shown in Fig. 1, or drawings from such photographs.

The skin incision is indicated in Fig. 2. It is made at least a finger's breadth below the border of the jaw, and should be straight and parallel to a neck crease. After reaching the platysma, the skin should be drawn downward and the incision to or through the deep fascia may be made at a little lower level than the skin incision. The collo-mandibular ramus of the facial nerve lies between the platysma and the deep fascia, and by suitable retraction it can be carried upward with the muscle, and its injury thus avoided.

The exposure which exists after this step is shown in Fig. 3. The margin of the sterno-mastoid muscle may then be retracted backward, freeing it from its attachments considerably above and below the site of the incision. The tonsillar node is then usually clearly brought into view and, by blunt dissection, may be detached from its anterior attachments, but should not be separated from the adherent nodes behind it. The mass of nodes which is grouped here is usually much larger than would be indicated by the external appearance of the neck. Their capsules may be grasped by toothed clamps and their attachments divided so as to give about the appearance indicated in Fig. 4.

As the deeper portion of this mass is being separated from the surrounding tissue there is danger of dividing the spinal accessory nerve above its entrance into the sterno-

mastoid muscle. The nerve is often completely surrounded by the node mass and may easily be mistaken for a portion of its capsule. In searching for it the portion of the node mass which is shown in Fig. 4 is often separated from the nodes which lie still higher and further back under the sterno-mastoid muscle.

Fig. 5 indicates its appearance after such separation, the deeply lying node on which it rests being drawn forward and the anterior border of the sterno-mastoid muscle being turned backward. The nodes may then be removed from beneath the upper part of the sterno-mastoid muscle as far back as its posterior border. This should leave a clean dissection of the area between the skull and line of the incision.

The nodes below this incision and beside the internal jugular vein may then be grasped by clamps and drawn upward while the lower margin of the wound is drawn downward, giving the appearance indicated in Fig. 6. By careful dissection and suitable retraction the node-containing area may then be explored almost down to the clavicle, and backward into the posterior chain behind the lower posterior margin of the sterno-mastoid: avoiding of course the lower part of the spinal accessory nerve in this region. The lower extent of the area here exposed is shown in Fig. 7. If there is difficulty in the dissection of this lower area, a second transverse cut may be made just above the clavicle.

Fig. 8 indicates the appearance of the wound area at the close of the dissection, but does not show the entire extent of this area, since the skin can be moved both upward and downward by retraction.

The method of wound treatment is important. Drainage should be provided, since there are wide spaces for the collection of serum, and possibly lymph and blood; and since there are defective lymphatics to provide for their absorption. A limited drainage, however, is usually sufficient. The method shown in Fig. 9 has proved satisfactory; a counter-opening is made below the incision and several strands of silk or silkworm gut are passed through this and through the wound.

The wound itself is closed with subcuticular stitches, excepting at the drain opening, a small piece of moist gauze is there applied, covered by rubber tissue and kept moist by the application of a few drops of saline solution applied under the rubber tissue every few hours.

In many cases this drainage, of course, is not needed, but where there are broken down nodes it is often very important, and it is a safe and easy method for all and if properly cared for is almost an absolute safeguard against deep-lying infection.

The patients are usually allowed out of bed on the second or third day after the operation and can leave the hospital within ten days, or two weeks.

The patient from whom these pictures were taken has remained free from recurrence; it is now two and a quarter years since his operation. Fig. 10 shows his appearance one year after operation. The scar is hardly to be seen, and he is very sturdy and strong.

The *possibility of vein injury* may be considered in a separate paragraph. There is of course extensive vein exposure in this dissection and the possibility of vein injury. Probably the vein most frequently injured is the posterior facial (see diagram, Fig. 11). It is occasionally adherent to the upper part of one of the enlarged nodes, and in the retraction it looks like a part of the node capsule and if nicked it may give a bothersome hemorrhage in an unexpected place, and since one naturally looks to the internal jugular as the probable source of such a hemorrhage, the real source may not be discovered at once. Small veins which run from the nodes into the large veins are also frequent sources of hemorrhage. When flattened out on the node they are not to be distinguished from the node capsule, and since they are close to the internal jugular or common facial veins their section may easily cause troublesome hemorrhage. Fig. 12 shows such a vein and Fig. 13 shows other inconstant veins which have been noted during operation.

An injury of one of these veins near its distal end is

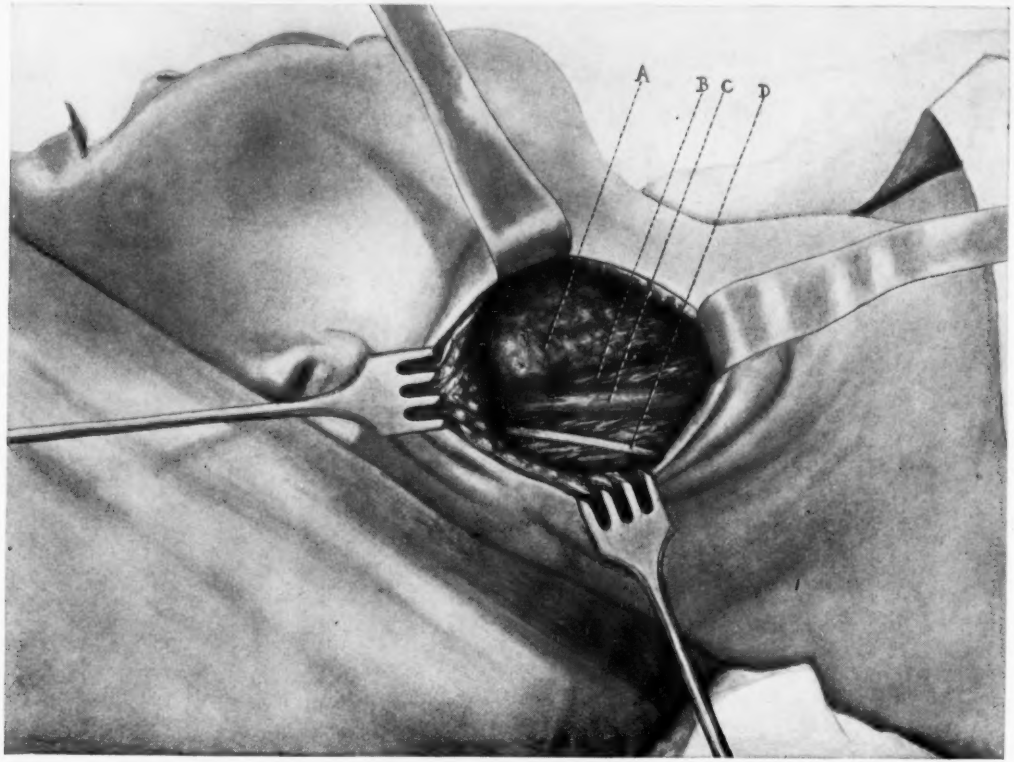
FIG. 1.

Early case of tuberculosis of the cervical lymph nodes. The swelling had first appeared about ten months previously: in the meantime the nodes had increased, diminished and again increased in size. The subparotid nodes which are here shown, are apparently the first ones enlarged in about 85% of the cases as they appear in New York.

FIG. 2.

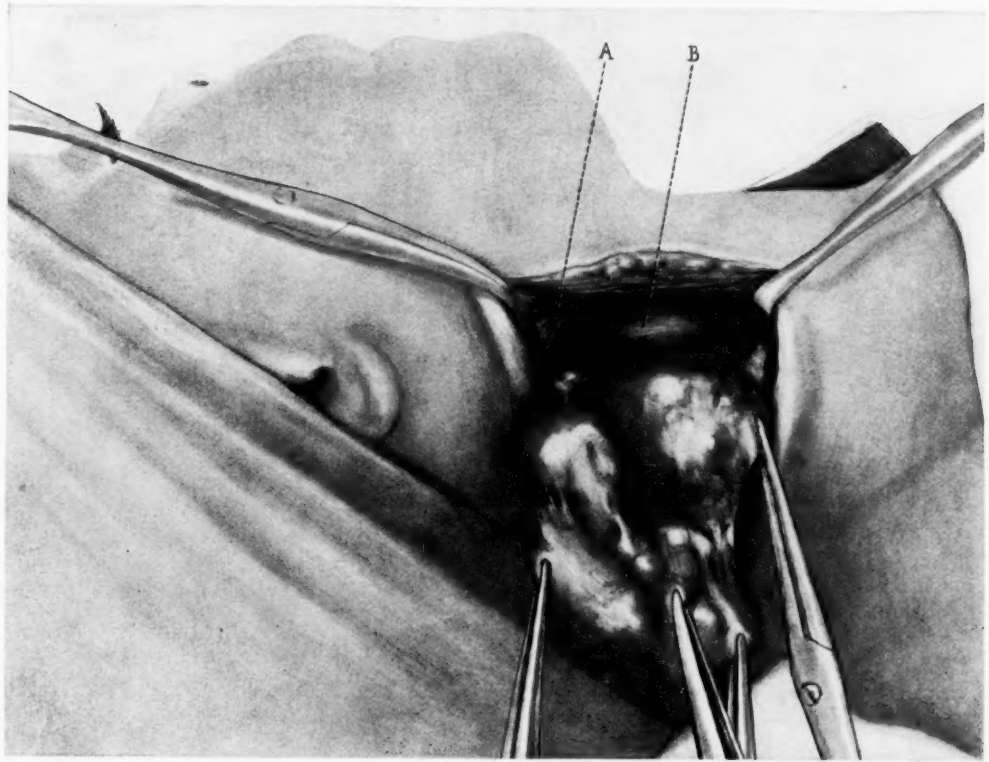
Incision: made at least a finger's breadth below the border of the jaw and in, or parallel to, a neck crease.

FIG. 3.



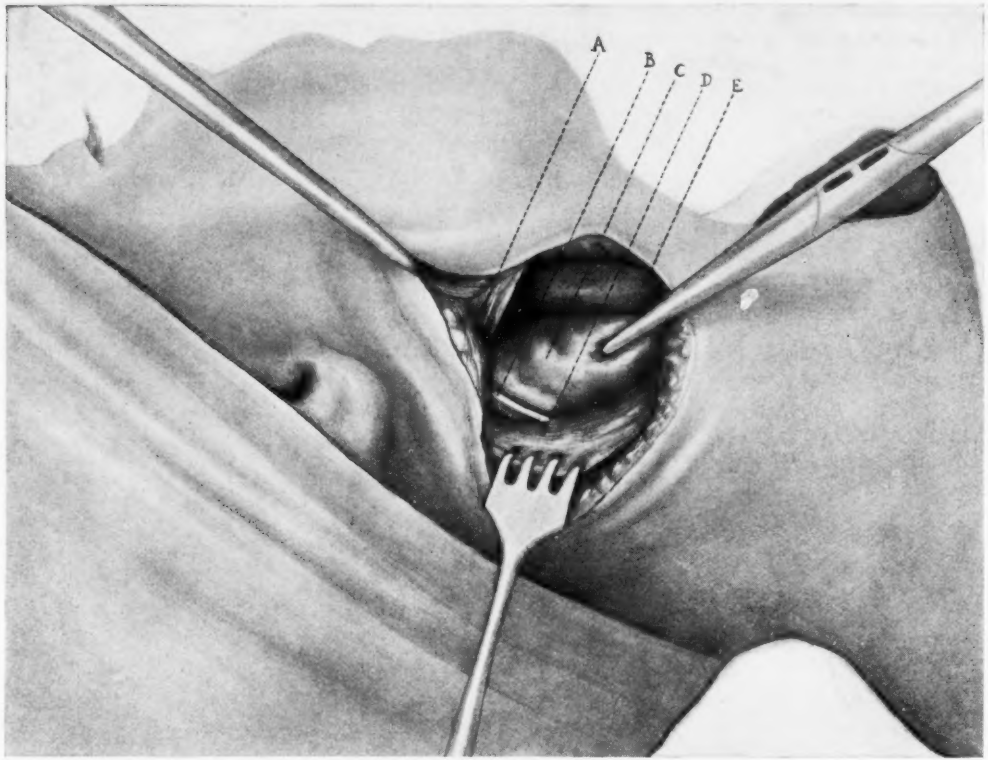
Exposure after retraction of platysma and deep fascia. A, Lymph nodes. B, Sternomastoid muscle. C, External jugular vein. D, Great auricular nerve.

FIG. 4.



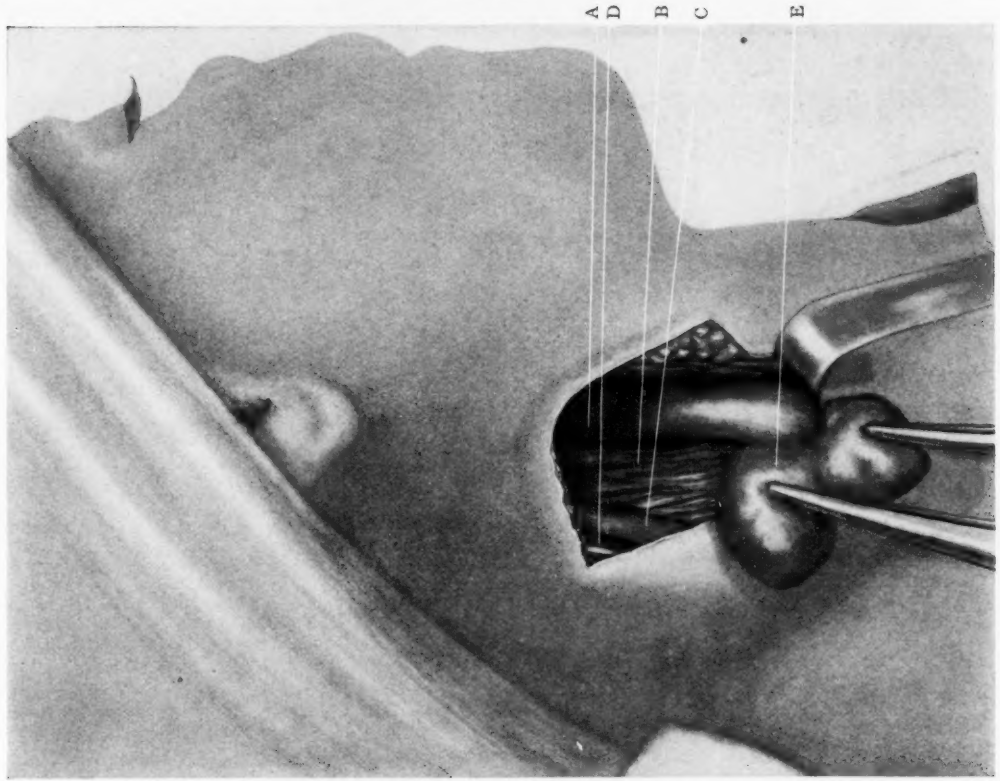
Main mass of lymph nodes, drawn out and reflected backward. A, Posterior belly of digastric muscle. B, Internal jugular vein.

FIG. 5.



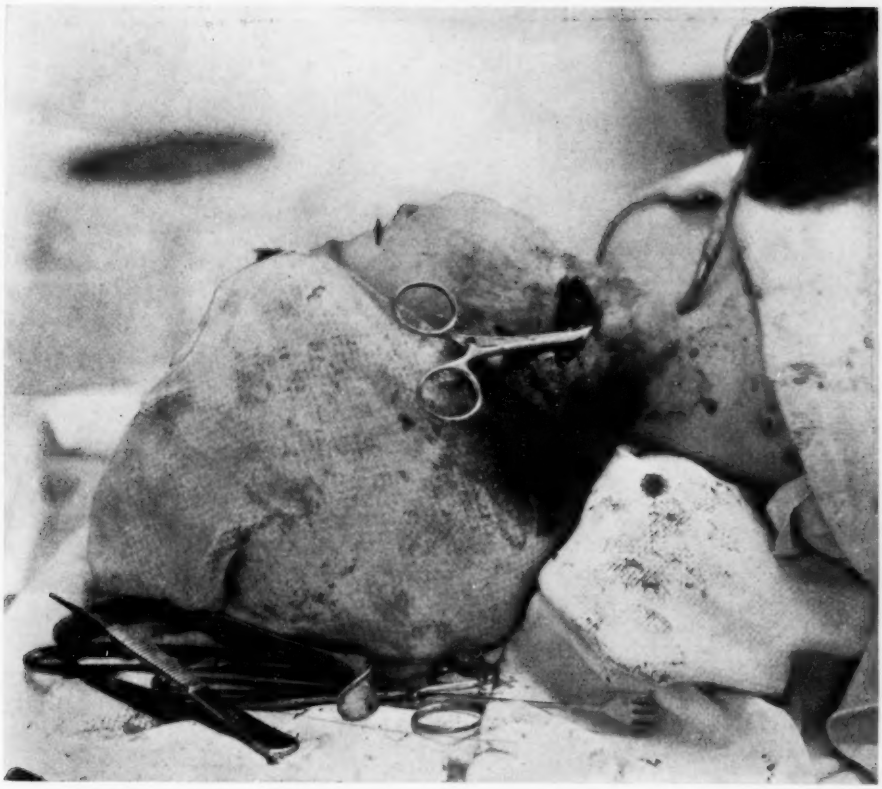
Exposure of spinal accessory nerve. A, Posterior belly of diagastric muscle. B, Spinal accessory nerve. C, Deeply lying lymph node, drawn forward. D, Sternomastoid muscle drawn backward. E, Internal jugular vein.

FIG. 6.



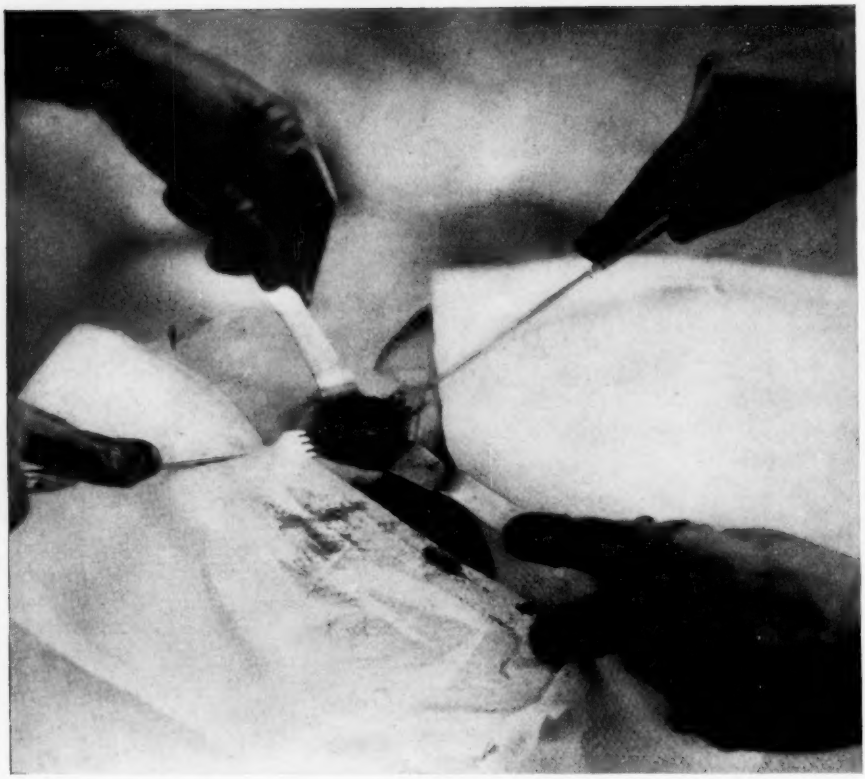
Removal of nodes from the lower part of the deep cervical chain. A, Internal jugular vein. B, Sternomastoid muscle. C, External jugular vein. D, Great cervical nerve. E, Nodes from the deep cervical chain drawn forward, upward and outward.

FIG. 7.



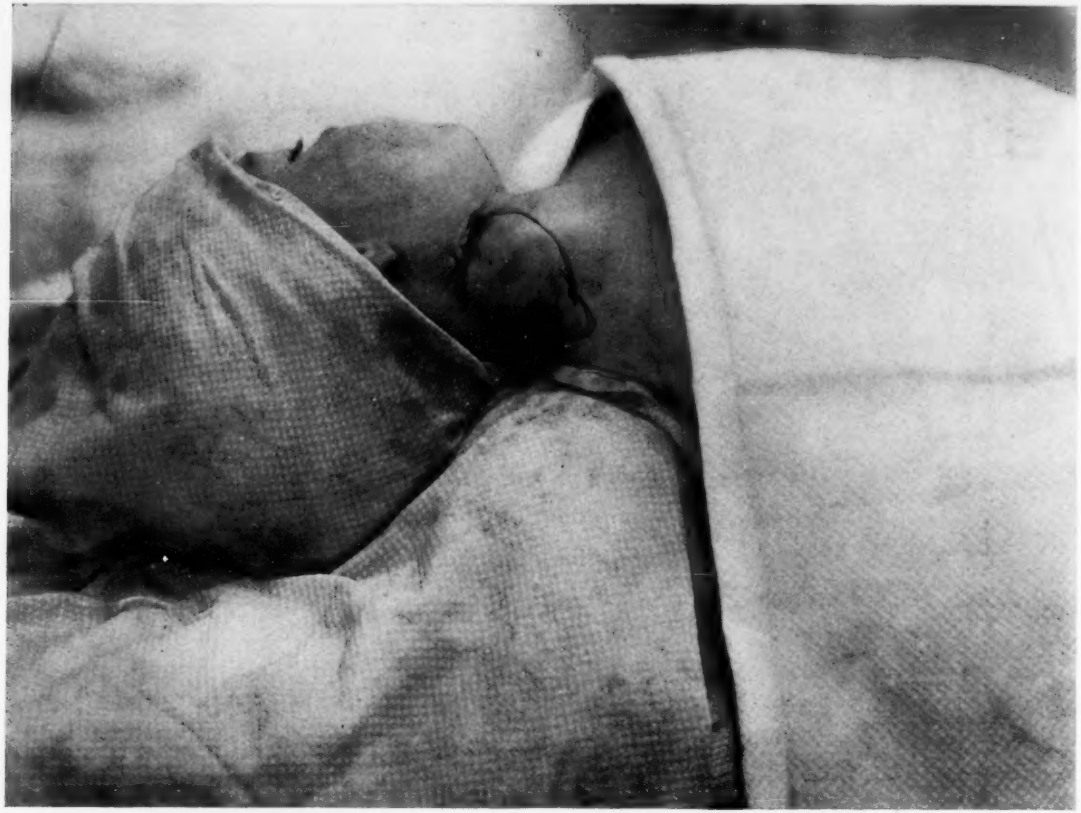
Showing lower extent of area from which nodes are removed. The internal clamp reaches to the spot indicated by the point of the external clamp.

FIG 8.



Photograph taken at the end of operation to show the extent of the exposure which is obtained through the transverse incision. The internal jugular vein passes prominently across the field.

FIG. 9.



Wound closed by subcuticular sutures. Drain of silk worm gut strands introduced under the sternomastoid muscle emerging through a posterior counter opening.

FIG. 10.

Photograph of patient one year after operation. Two and a quarter years after operation he was shown at the New York Surgical Society without recurrence and with a scar even less noticeable than this photograph indicates.

FIG. 11.

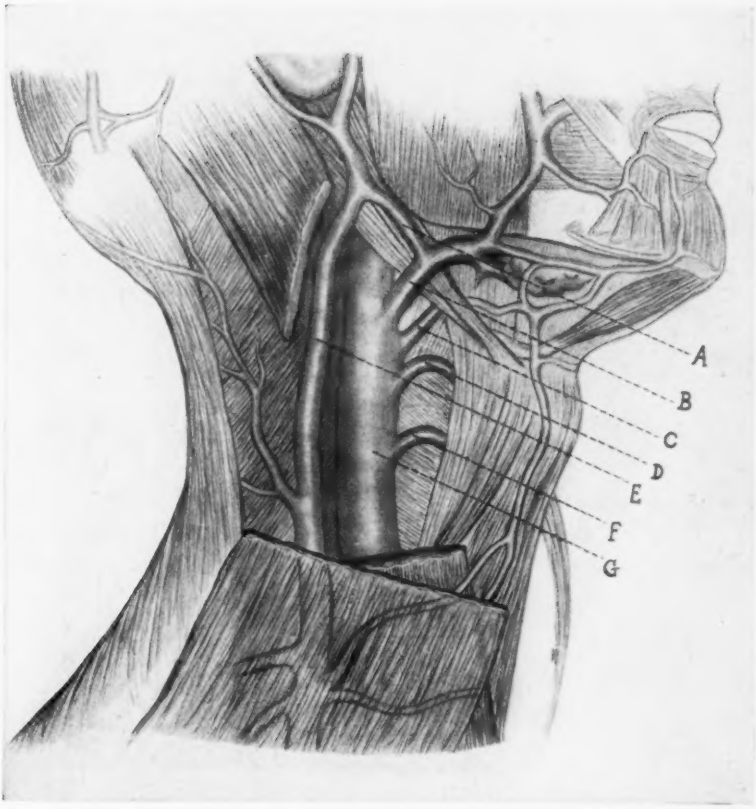
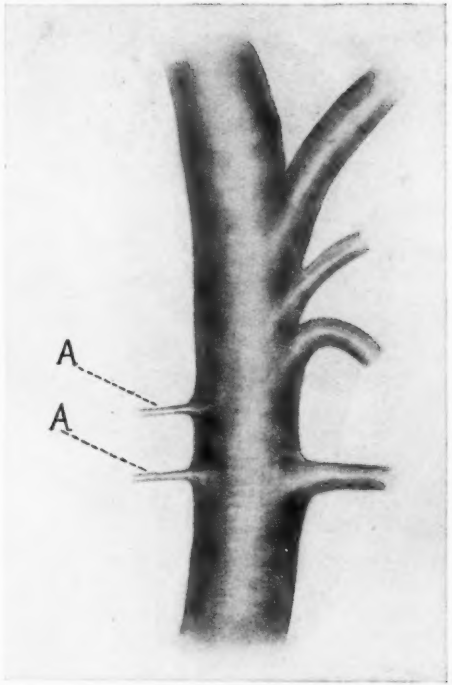


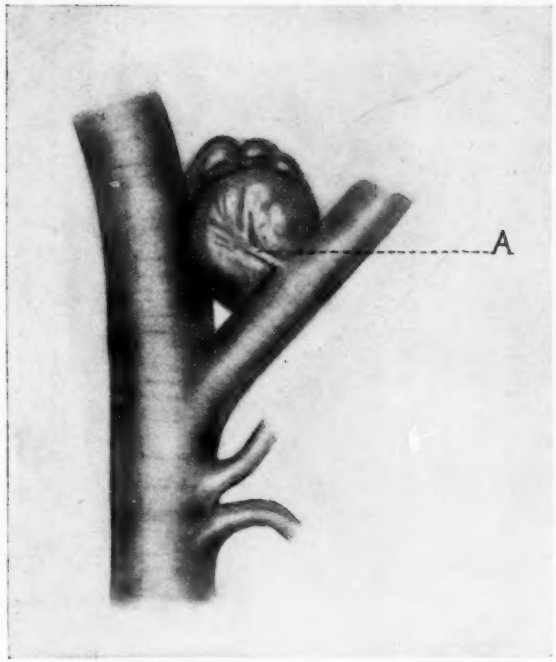
Diagram of veins of neck adapted from Gray's anatomy. Showing the location of the posterior facial vein (A) from which bothersome hæmorrhage may easily occur. A, Posterior facial or anterior temporomaxillary vein. B, Common facial vein. C, Lingual vein. D, Laryngeal vein. E, External jugular vein. F, Superior thyroid vein. G, Internal jugular vein.

FIG. 12.



A, A, Inconstant branches, entering the internal jugular vein from behind where they may easily be injured.

FIG. 13.



Small vein (A) running fom lymph node into common facial vein: where flattened by traction it resembles a node capsule. Its section near the main vein is practically a wound of that vessel.

practically an injury of the internal jugular. If it should occur or if the internal jugular itself should be incised, the opening should be secured by one or more artery clamps and then included in an over-and-over suture of small silk, thus preserving the lumen of the vein.

The writer can report on 66 cases which, in condition of lymph nodes and type of operation, may be classed with the one here figured. These patients all recovered from the operation within a reasonably short time. There was only one serious complication in their number—a secondary hemorrhage from the internal jugular vein, which occurred in an infected case on the ninth day after operation. It was controlled by pressure, but to avoid its recurrence the vein was ligated above and below, and prompt healing followed.

The later history of these cases has been followed with much care. One has been followed nearly five years from the time of operation; 12 have been followed into the fourth year; 9 into the third year; 18 into the second year; 15 into the first year; 12 have not been observed since leaving the hospital.

The appearance of these cases as they have been examined at various periods after operation has been almost uniform. There are usually a few small superficial nodes in the posterior chain which are just palpable, hardly larger than peas. The tonsillar node on the other side of the neck is usually about the size of a lima bean, otherwise no enlarged nodes can be felt. These enlargements are, I believe, hyperplastic and not tubercular, due probably to the increased demand which is made upon the nodes after the removal of so many others.

I have watched nodes of this kind year after year and have hardly ever seen them increase in size, and have frequently seen them subside. A few of them have been removed and almost without exception have been found to be hyperplastic.

Among these 66 cases there are three who have filbert-sized nodes which may be regarded as recurrences. In a

fourth one a discharging sinus appeared in the wound area; it closed spontaneously; he also had a node removed from the parotid gland by operation. No doubt there will be some other recurrences among these 66 patients, but the present report of only four known recurrences is surely very encouraging, and indicates that there is a large class of these early cases for whom an operation may be done which is safe and thorough, which hardly leaves a scar, and which is followed by a very large proportion of cures. These favorable cases are found more often among the well fed and well housed people, particularly children, than among those less fortunately situated.

The report of this type of early cases should be accompanied by a brief report of all the writer's cases, extensive and otherwise. There are 256 of them. There was only one operative death in the entire number; it occurred in a very unfavorable case, from secondary hemorrhage from the internal jugular. These cases have been followed for long periods, varying from 12 years down. The exact details are not now in available form and will be given in a later report, but they bear out the indications of the report made in 1905 of between 75 and 80 per cent. of apparent cures, and many other cases who will probably be cured after further operations.

DESMOID TUMORS OF THE ABDOMINAL WALL.

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THE term "desmoid" was first used by Johannes Mueller [1] with application to certain tumors of connective tissue origin, and as the name implies, of "tendon-like" consistency, arising from the abdominal wall. These tumors are so unusual, and present such interest and possible difficulty in diagnosis, that the recent occurrence of a case in the clinic of Dr. Watts, at the University of Virginia, suggested the advisability of placing the case on record, with a brief résumé of the literature of the subject.

It is well, first of all, to determine what shall, and what shall not be included under the term desmoid. There have been some who would so classify the fibro-myomata of the round ligaments arising in the canal of Nuck, but essentially analogous to the ordinary uterine myomata. Similarly, the tumors to which attention was called by Nélaton,[2] arising from the bony pelvis and invading the abdominal wall, have been considered desmoids; but the weight of opinion is decidedly toward excluding these classes of tumors from the category of true desmoids. The conception of Pfeiffer,[3] which is also that authorized in v. Bergmann's "Handbuch der Praktischen Chirurgie," would restrict the use of the word "desmoid" to fibromata or fibro-sarcomata arising from the musculo-aponeurotic structures—muscles, muscle-sheaths, aponeuroses, lineæ transversæ, etc.—of the abdominal wall itself, thus excluding tumors originating in the bony pelvis or the round ligaments, as well as those springing from the skin or subcutaneous tissues.

In reviewing the literature, one is struck by the fact that the great majority of the articles on the subject are reports of single, or at most, three or four cases. There are, however,

two prominent exceptions to this general rule, in the monographs of Ledderhose[4] and Pfeiffer.[3] The first of these writers has collected 100 cases from various sources; the second reports 40 cases of his own, to which he adds 360 more cases collected from the literature, including the 100 cases of Ledderhose already mentioned, thus making a total of 400 cases in all. So thoroughly has the last author worked over the literature up to the date of his publication, that we feel it unnecessary to do more than refer the reader to this article with its voluminous bibliography, for work done before 1904. Since that date, we have been able to collect the following cases, which we report here in brief abstract.

CULLEN[5]: Mrs. N. M., 30 years old. No note of pregnancy. Tumor in left hypochondrium. Tumor lobulated and freely movable. At operation it was found to be attached to the sheath of the abdominal muscles, and in removing it, some of the muscle was taken out with the tumor. Pathological report: pure fibroma.

SCHWARZSCHILD[6]: Case I. Woman 28 years old. Tumor present in right side of abdomen for 2 years; growth very slow. For past half year, following directly upon labor, growth has been more rapid. Tumor is now the size of a child's head, hard and nodular, and attached to abdominal wall. Diagnosis: fibroma. At operation, the tumor was found to be closely adherent to peritoneum and a large defect was left by its removal, which was closed by a plastic operation. After one year, no recurrence, no hernia. Pathological report not made.

Case II. Woman, 30 years old, mother of two children. In the right lower quadrant of abdomen is a tumor, the size of a hen's egg, which is attached to abdominal wall, but not adherent to the skin. At operation the tumor was found to spring from the posterior surface of rectus, but was not adherent to peritoneum, which was not opened. Diagnosis: desmoid.

EITEL[7]: Mrs. J., aged 26 years. Tumor above and to left of symphisis pubis, of 10 months' duration and slow growth. Slight pain. Tumor size of fist, hard, encapsulated, deeply embedded in abdominal wall. At operation, tumor was found just beneath external oblique muscle, involving all the structures down to the peritoneum, to which it was adherent. Apparently tumor originated from fascia transversalis. Good closure without plastic. Patient now well. Pathological report: very cellular fibroma.

GROSS AND SENCERT[8]: Woman 73 years old. Tumor of 10 years' standing, arising to left of middle line and occupying whole left half of abdomen. Tumor very large, weighing 6 kg., and extensively ulcerated. Patient in condition of septicæmia. Tumor found at operation to be

attached by pedicle to the anterior sheath of rectus, and originating at the position of one of the lineæ transversæ. Pathological report: partly gangrenous lipo-fibroma.

ECCLES[9] and BEDWELL[10] report several cases of fibro-sarcomata of the abdominal wall, and another case is reported by TAPIE and DAUNIC[11] but the writer was unfortunately unable to gain access to these articles.

Besides these cases, five others have been collected from the surgical service of the Johns Hopkins Hospital, for the permission to use which we wish to thank Dr. Wm. S. Halsted and Dr. Jos. C. Bloodgood of that institution. These cases were grouped under the caption "tumors of the abdominal wall," and were collected from a general surgical service now exceeding 21,000 cases of all kinds. The abstracts follow.

CASE I.—A man, aged 27, with tumor just below umbilicus in mid-line. Duration 6 years. During the past 5 months, more rapid growth has been observed. Tumor is hard, smooth, just under skin, freely movable. Tumor easily enucleated. No statement as to attachment of tumor to deep structures. Microscopically, the tumor is composed largely of spindle cells.

CASE II.—Woman, aged 56. Has borne a child. Shortly after labor, a painless, slow-growing tumor appeared just to left of umbilicus. Tumor was incompletely removed, the wound became infected, and healed with a large scar. For the past 20 years there has been a gradual recurrence in this scar, the tumor involving the skin. For five years, the tumor has been ulcerated, which patient attributes to trauma. Lately two small secondary nodules have appeared in skin to right and left of original growth. Tumors are hard, freely movable on deep structures, but firmly fixed to the skin. Tumor easily removed, and no note made of any attachment to deep structures. Pathological report: spindle-celled tumor.

CASE III.—Woman, aged 23 years, with tumor of 6 months duration, onset following pregnancy. Tumor to the left and below umbilicus, is palpable but not visible. Tenderness prevents accurate palpation, or definite outlining of mass. Fixed to deeper structures. At operation, tumor is found to be attached to posterior surface of the sheath of rectus.

CASE IV.—Woman, aged 35 years, with rapidly growing tumor of the right lower quadrant of abdomen, following pregnancy. No pain. Tumor is hard, nodular, with skin freely movable, and itself movable on deep parts. At operation, tumor is described as subcutaneous, but note states that part of rectus had to be removed with it, because of its firm adherence to the anterior sheath of that muscle.

CASE V.—Colored woman, aged 18. Tumor appeared during pregnancy, to left of and just below umbilicus. Only a few months duration.

Tumor is hard, somewhat nodular, and seems to be beneath rectus sheath. At operation, tumor is found under the anterior sheath of rectus, and infiltrating the muscle. Pathological report: spindle-celled sarcoma.

At this point we would enter a brief commentary upon these five cases. Case I may or may not have been a desmoid. Neither the clinical findings, nor the operation note, make clear its point of origin, and it may perfectly well have been an ordinary subcutaneous fibroid nodule. It must bear the verdict " not proven." Case II similarly is not above suspicion. Whatever the nature of the primary growth, which was incompletely removed long before the patient sought the hospital, the recurrence in the scar certainly bears much closer resemblance to a keloid or sarcoma of the skin than to a true desmoid. As to the last three cases, we can undoubtedly regard them as cases for inclusion in the class of tumors under consideration. We would like to draw attention to Case V, as far as we know a unique example of true desmoid in the negro, contrasting strongly with the frequent occurrence in this race of the keloid, a tumor certainly very closely related to the desmoid.

Finally, we have to add to the cases here compiled, one which has recently occurred in our own clinic, and which led primarily to this review of the subject.

Mrs. A. G., widow, aged 23 years, entered the hospital complaining of an abdominal tumor. Her family history is of no importance. The striking fact in her past history is the instrumental delivery of a still-born child, said to have been unusually large. This was the only pregnancy. The present illness began seven months ago, when patient noticed a lump in the left half of the abdomen. There has been no apparent growth since discovery. No pain or other subjective symptoms of any kind. On examination, the patient's general condition is excellent. No organic lesions. Patient quite stout. Abdomen is full, soft, with thick fatty walls. Nowhere tender. About 2 cm. to left of the umbilicus, there is an ill-defined, deep-lying, ovoid mass, measuring about 8 cm x 5 cm., with its long axis parallel to the fibres of the rectus. It is firm, smooth, and the skin over it is freely

movable. The mass itself moves with the abdominal wall. No apparent connection with the pelvis, or the internal genitals. Vaginal examination throws no light on the nature of the tumor. No other masses anywhere.

A definite diagnosis was not made. The very thick abdominal walls gave the impression that the tumor was intra-abdominal,—in fact it was partly so,—and the possibility of an omental or mesenteric growth, perhaps with adhesion to the anterior abdominal wall was considered.

At operation, the tumor was found to be a desmoid, arising from the posterior sheath of the left rectus, involving the entire thickness of the muscle, and the median two-thirds of its width. The greater mass of the tumor projected backward into the abdominal cavity, to such an extent that the bulk of the tumor was intra-abdominal, and was firmly adherent to the peritoneum. In excising the growth, a piece of peritoneum 4 x 5 cm. was removed with it. The abdominal contents were normal. Closure was effected in layers, and a strong repair made without the necessity of any plastic measures. Pathological report: very cellular fibroma.

In reviewing the cases above reported, with those collected by other authors, certain salient features have been observed in regard to desmoids, which are commented upon by all the writers on the subject. These characteristics we will proceed to outline, using Pfeiffer's work freely for statistics.

Pathology.—These tumors are of connective tissue origin and spring from the musculo-aponeurotic structures of the abdominal wall. In the gross they are hard tumors, occasionally with areas of softening from cystic degeneration; smooth or slightly nodular in outline; cut with a crisp grating, and on the cut surface present a dense fibrous structure. Microscopically the majority of specimens present the typical picture of a more or less cellular fibroma. In a certain number of cases, careful sectioning shows areas of sarcomatous change, and a few are pure sarcomata. Other variations occasionally met with are tumors presenting areas of myxomatous or

hemorrhagic degeneration. These facts have led to the use of various compound names, *i.e.*, fibro-myxo-sarcoma, etc., but the best authorities sustain the practice of Sänger who groups all these tumors under the one term desmoid. The former generally accepted belief in the rarity of malignant tumors of this class has been considerably modified by the statistics of Pfeiffer [3] in whose tabulation 10.6 per cent. of the cases in women and 24.4 per cent. of those in men were sarcomata. This large proportion of malignant cases in the male is worthy of note, as is also the curious fact, that the clinical and microscopic evidences of malignancy show less harmony in this class of tumors than perhaps any other. Tumors which show rapid growth, invasion of neighboring parts, and pain, not infrequently are pure fibromata; whereas, on the other hand, clinically benign, quiescent growths may present typical fields of sarcoma under the microscope.

Incidence.—The rarity of these tumors may be appreciated from the statistics of Guerlt, obtained from the Vienna hospitals, .13 per cent. of desmoids in 16,637 tumor cases. Perhaps the most striking peculiarity of the desmoid is the preponderance of its occurrence in women, and particularly parous women. Nor infrequently the tumor is first discovered during pregnancy or the puerperium. To have recourse again to Pfeiffer's figures, he shows that 87.1 per cent. of his cases were in women, and that 94.3 per cent. of the women had borne children. The tumors may occur at any age from 1½ to 81 years. In fact, a rare case or two, considered congenital, is on record. The period of life of greatest liability is from 25 to 35 years in women and 35 to 50 in men.

Location.—The most frequent position of desmoids is in the right lower quadrant of the abdomen. The anatomical structure from which they most frequently arise is the rectus abdominis muscle, or its attachments, sheath, lineæ transversæ, etc. Next in order of frequency come the external oblique muscles, the fascia transversalis, and the lineæ alba. A characteristic of the tumors, which are usually ovoid, is that their long axes are nearly always parallel with the direction of the

fibres of the muscle in which they are growing, so that desmoids in the middle of the abdomen lie longitudinally, whereas those in the flanks are transverse. Nélaton [2] believed that these tumors frequently originated from the bony pelvis, and that most of them were connected with it by a fibrous pedicle, but Guyon [12] has shown that such a connection either does not exist at all, or is simply a band of fascia under tension. Desmoid tumors are solitary; at least, multiplicity has never been proved.

Etiology.—The peculiarities of desmoids have led to much speculation and discussion as to whether they may not have some special causation aside from those factors that may lead to tumor growth elsewhere. The fact to which attention was drawn above, namely, that pregnancy seems to bear some relation to the incidence of these neoplasms, and the further fact, that many cases occurring in men or nulliparous women, give a history of preceding trauma, has furnished ground for much speculation. Herzog [13] and others support the theory that during pregnancy or parturition there is a rupture of the structures of the abdominal wall that leads to a fibrous scar or a hematoma. This scar or organizing hematoma is conceived to be the starting point of a desmoid, in much the same way as a skin scar is the starting point of a keloid. Others have supposed that the stretching of the muscles of the belly-wall during pregnancy plays an important part in the process, and explain the striking absence of desmoids in cases of distention from ascites, ovarian cysts, etc., on the ground that in these conditions the blood-supply to the abdomen is impaired, and the general nutritive resources of all the tissues is low, whereas in pregnancy, just the reverse is the case. Certain experimental work on pregnant and ascitic animals lends color to this reasoning. But while pregnancy may present favorable conditions for desmoid formation, the not infrequent occurrence of such tumors in cases with no history of either pregnancy or trauma, makes it probable that there is some other more important factor in the etiology, and the general belief is that the cause of desmoids will be explained only

when the mystery, that as yet enshrouds neoplasms in general, is finally solved.

Clinical Course.—In the majority of cases, the patient accidentally discovers the existence of the mass. Pain or subjective symptoms of any kind are unusual; if the growth be quite large, there may be dragging, aching sensations, or the tumor if large and properly situated may give rise to visceral disturbances from pressure, the bladder being the organ most frequently involved. The tumors, when first discovered, are usually from about the size of a hen's egg to that of a clenched fist. In most cases growth is slow, possibly imperceptible. Calcification may put a stop to the progress of the tumor. In some cases, however, growth may be quite rapid, the tumor reaching the size of a child's or even an adult's head in a few months. Recession and spontaneous disappearance of a true desmoid has never been observed. The larger tumors, particularly if projecting anteriorly, are liable to traumatism or friction from the clothing, and as the skin over them is tense and thin, with dilated veins, conditions favorable for ulceration exist. When this occurs, a portal of entry for infection is of course opened, and death from this cause is a well recognized termination of large desmoids.

The lymph glands usually are not involved unless the tumor is of a most malignant type. As has been stated above, clinical indications that suggest malignancy, such as recurrence after apparently complete removal, or invasion of surrounding parts, may occur in tumors microscopically benign. It should be noted in passing that such "invasion" is really rather a pushing aside of the neighboring tissues, since although these tumors seldom have a definite capsule, they are well circumscribed, and neither clinically nor microscopically tend to diffuse permeation of the tissues, except in cases of pure sarcoma. Let me again, however, call attention to the figures given above regarding the frequency of sarcoma, particularly in men, and emphasize the mistake made in the past of attributing so little possibility of malignancy to desmoids.

Diagnosis.—One would think there would be little diffi-

culty in recognizing these growths, and in many cases this is true; but where the patient has thick abdominal walls, and the tumor is deeply situated, it is by no means easy. A tumor springing from the anterior sheath of the rectus is usually easy to diagnose. Such a tumor, which is freely movable when the abdomen is relaxed, disappears or becomes fixed when the muscles are made tense by straining, or raising the head from the pillow without the help of the arms. From cases lying within the muscle, suppuration, hematoma, and cysts of various kinds have to be differentiated. The tenderness and other signs of inflammation usually render the first of these problems easy. Cysts may be diagnosed by aspiration, particularly if this possibility is suggested by fluctuation, which is not, however, always present in cysts. In deep lying hematomata with firm tense capsules the findings may be most confusing, but the fact that a hematoma either is absorbed or suppurates, whereas a tumor grows, will distinguish the two lesions if one has opportunity to observe the case for a time, or can secure a trustworthy history.

Lastly, and most difficult of all to diagnose, are those cases in which the tumors project posteriorly into the abdominal cavity. Here one has to consider the possibility of the tumor being of visceral origin, and if the walls be thick, palpation is most unsatisfactory. Tumors of the liver may be ruled out by the descent of that organ with inspiration. The spleen usually has a characteristic edge, but certain cases may be most confusing. Kidney tumors can usually be ruled out by the change in percussion and palpation following inflation of the bowel. Intestinal growths give rise to symptoms which are entirely unlike the desmoid picture, and are besides usually mobile and take up different positions. Finally, the rare tumors, especially sarcomata, of the omentum or mesentery, may present great difficulty, and indeed, if they are adherent to the anterior abdominal wall, the distinction may be impossible to make.

Treatment.—The question of what to do for these growths, may be answered in two words: *operate early.* The

not remote possibility of malignant degeneration in any tumor of this class is sufficient reason for such advice, but aside from this the direction of growth of many desmoids furnishes another strong reason. All of the cases which spring from the posterior wall and grow backward naturally become closely applied and adherent to the peritoneum. Furthermore, in their extension laterally they either cause pressure atrophy of the muscles, or push them aside. The longer such a condition lasts, and the further it extends, the larger defect is made both in the muscular and peritoneal layers, by the complete removal of the tumor. We have not space to describe the ingenious plastic methods employed in the closure of wounds by some of the surgeons who have removed large tumors; but we feel sure that one who has been forced to such resorts will afterward be a vigorous advocate of early operation. The chief factors that prevent perfect results are the occurrence of post-operative herniæ and recurrences of the tumor. That we may emphasize the gravity of the condition, we present the following statistics collected since the introduction of antisepsis.

Mortality in laparotomy cases.....3.5 per cent.
Mortality without laparotomy.....1.05 per cent.

Recurrences in men .....68.1 per cent.
Recurrences in women .....90.0 per cent.

Final cure, surviving 1st and possibly 2nd and 3rd operations:
Men .....50 per cent.
Women .....21.2 per cent.

In conclusion, I wish to express my gratitude and appreciation to my chief, Dr. Watts, for his stimulating support in the preparation of this paper.

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NOTE ON SYPHILIS OF THE LIVER.

WITH A REPORT OF THREE CASES IN WHICH OPERATION WAS RESORTED TO.

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ACQUIRED syphilis of the liver in its tertiary stage assumes three distinct microscopical types: First, when the eruption shows itself in the form of white milky patches, irregular star-shaped in form, due to an inflammation of the Glisson's capsule as first pointed out by Virchow. Second, single gumma, frequently large and usually on the anterior surface or along the anterior border of the liver. Third, multiple gummata which appears to be the more frequent form, varying in size from a small bird-shot to an English walnut.

As Rolliston says, "The right lobe is much more often affected, and the anterior surface far more frequently than the under aspect. In eighty-six cases of hepatic gummata collected by J. L. Allen, only eleven were single. It is said that the neighborhood of the falciform ligament is a favorable situation for gummata." But Rolliston has not noticed any such tendency except for the anterior surface.

The gross appearance of old gumma presents raised tumors irregularly nodular with three concentric zones,—the centre yellow and softened; the middle one whiter, more resisting, and elastic; the third or exterior, a fibrous shell.

The first form is perhaps the early manifestation of commencing sclerosis with which it is sometimes associated. Maurice describes this type as sclerogummata. The differential diagnosis between carcinoma of the liver and the larger gummata is often difficult. The syphiloma is smoother and not quite so nodular in feel, and is usually of a yellower color.

Primary carcinoma of the liver is rare; it is more rapid in its course, and the patient is usually sicker than with syphilis, and, as Cumston says, "Enlargement of the spleen favors

syphilis." Multiple gummata of moderate size may also closely resemble carcinoma in its secondary stage, while the smaller syphilides may at times resemble miliary tuberculosis.

Syphilis is sometimes mistaken for cirrhosis of the liver. In such cases hæmatemesis, dilated veins in the abdominal wall, ascites, and dyspepsia are less frequently seen than in cirrhosis. When ascites is due to cirrhosis the patient is thinner, while in syphilis the general nutrition may be fairly preserved. In cirrhosis, if the liver is enlarged, it is usually more symmetrical than in syphilis, for in the later condition there is usually an irregular enlargement. As the iodides are frequently given in cirrhosis, some of the reported cures of this disease may have been due to a mistaken diagnosis. In all three of these types the diagnosis may have to be settled by a course of antisyphilitic treatment or by the removal of a piece of the tumor for microscopical examination, as was done in two of the cases reported below.

Symptoms.—It is quite surprising how many of the fifteen cases of syphilis of the liver already operated upon and reported by Keene and Cullen give no previous history of syphilis, nor any of the ordinary evidences of tertiary syphilis aside from the liver condition itself. In most of the reported cases the statement is made that they have not had the ordinary primary or secondary symptoms of syphilis; that they have not had primary sores, skin disease, falling of the hair, chronic sore throat, rheumatism, and that there is no enlargement of the glands. It seems to me that there are two possible explanations,—the first, that there are so many extra-genital primary sores which are not recognized as syphilitic; and, second, that the cases giving the ordinary symptoms have been properly diagnosed and treated, thereby preventing the later liver symptoms; or, if a certain case has had the ordinary primary and secondary symptoms, the later tertiary liver troubles will be much more easily diagnosed and the proper treatment instituted, thereby avoiding, perhaps, the necessity of an exploratory operation.

Of the cases which have come to operation, many have

given only slight symptoms of any kind. The patients have looked well and have only suffered mild distress in the epigastric region; there has usually been a jaundice for several weeks with a temperature of about 100° F., loss of flesh, and some enlargement of the liver. In several with a distinct tumor which felt like an enlarged gall-bladder, and in a few with a small ascitic accumulation. Many of these cases have had colic, like biliary colic; and if associated with enlargement and tenderness in the gall-bladder region, it is not surprising that they have been mistaken for gall-bladder cases.

Treatment.—If syphilis of the liver is suspected, a course of antisyphilitic treatment, especially large doses of the iodides, should be given, and will cause a cure in a large proportion of cases. From fifteen to thirty grains of the iodides of potassium and sodium t. i. d. combined with mercurial inunctions, or, in acute cases, intramuscular injections of the mercurial salts. But, in spite of large doses of the iodides, some cases of large gummata will not disappear. Such cases are recently reported by Mr. R. Parks and Dr. Garrod.

This brings us to the question of the operation. Auschultz and Hans Kerr think that even after exploration, if syphilis of the liver be found, the wound should be closed and the patient be put upon antisyphilitic treatment. This position is undoubtedly correct in all cases except where large gummata are found, for these are the cases which persist in spite of treatment. My own experience, when viewed in the light of the reports made by Keene, Robeson, Mayo, and Freeman in removal of large tumors of the liver of various kinds, makes me feel that the surgery of the liver is just commencing, that it is a fruitful field, one that we have shunned on account of the fear of hæmorrhage; that many of the tumors of the liver which we have universally abandoned can be safely removed to-day.

Hunbald reports ninety-six cases of resection of the liver, being all of the cases reported in the literature that he could find, with a mortality of 26 per cent. This includes Keene's list with a mortality of 15 per cent., while Cullen, who has

tabulated all of the cases since Keene's reports finds seventeen with two deaths, or a mortality of 11.7 per cent. But to return to the surgical treatment of gummata: I find ten cases of either complete or partial removal of large gummata, including my own case, with two deaths, both of these deaths were treated by the elastic ligature method, making a mortality of 12.5 per cent.

The removal of gumma helps in the cure of any case because there is much less tissue to be absorbed. If antisyphilitic treatment was certain to absorb all gummata, then the risk of removal would not be justifiable. But as it will not always absorb large gumma, and as the diagnosis is not always certain from gross appearance of the growth, removal is justifiable.

Keene favors the removal of tumors with a red-hot cautery knife, tying the large vessels separately with catgut. Mayo reports one case successfully treated in this manner. The constriction of part of the liver with an elastic ligature behind hat-pins has been successful in a few cases, but is also responsible for some of the late deaths. Konsnietzoff's blunt needle with double catgut, as used by Mikulicz, is perhaps the best method of controlling the hæmorrhage after removing the tumor. Gauze tamponing of the raw surface, especially after the use of the cautery, is an additional precaution in preventing hæmorrhage.

Case I.—A patient seen in consultation with Dr. Herbert Davis. This man was forty years of age, who denies syphilis, and has not had, nor does he give now, any signs of syphilitic infection. He had been suffering with indefinite pains through the right upper abdominal cavity, with a moderate enlargement of the liver, first noticed six weeks ago. He had been suffering with attacks of colic for the past three months, with some loss of flesh and strength. On exploration, December 12, 1903, I found an enlarged liver, its upper surface covered with white star-shaped patches, while its under surface presented several hard, white nodules from the size of a plum to a pea. One moderate sized nodule near the anterior surface was removed and the wound sutured with catgut, the end of a gauze drain being attached to

the liver. Two microscopical diagnoses were made, one for carcinoma and one for gumma. After exhibition of the iodides, the enlargement of the liver disappeared, and the man gained twenty pounds in three months. As he has remained perfectly well, now over two years since the operation, it is reasonable to conclude that the diagnosis of carcinoma was not correct.

CASE II.—Large gumma of the anterior border, operated upon four and a half years ago. Mrs. B., seen with Dr. Jeannette MacLaren in December, 1900; thirty years of age; mother of three healthy children, aged seven, six, and three, respectively. These children show no evidence of hereditary syphilis, but are not a very vigorous type. Five years before was treated by Dr. Schadle for some throat trouble; after operation, which I am here describing was performed, it was discovered that at this time she had a perforation of the soft palate, which quickly healed afer a course of iodides. One year before I saw her, Dr. Charles Greene treated her for pulmonary tuberculosis. Tubercule bacilli were found in the sputum. Under treatment, her weight improved in three months from 107 to 120, and the tubercle bacilli disappeared from the sputum. Dr. MacLaren had treated her for chronic pelvic disease and general anæmia, which always promptly responded to local treatment and Blaud's pills. The abdominal growth was first noticed in August, 1900, which was not tender at any time. In October she became quite anæmic, although the blood was not changed; red corpuscles normal; no increase of white cells. Temperature was from 100° to 101° F.

Operation, December 6, 1900. A large white tumor on the anterior border of the left lobe, overlying the gall-bladder, the size of a man's fist, not pedunculated, extensive adhesions to the omentum. This tumor was removed, with at least one inch of normal liver substance, with a knife after an over and over catgut suture passed with a large, curved, round pointed needle constricting the same tissue more than once, when it showed a tendency to bleed. Iodoform gauze-drains were packed against the large raw surface left after removing the growth. This woman promptly recovered, and has remained perfectly well, now four and one-half years since the operation. She has had iodides since the operation on several occasions. Dr. Westbrook diagnosed gumma.

CASE III.—Mrs. L., seen with Dr. Sweeney. Patient is

thirty-six years of age; married sixteen years. Soon after marriage she had an attack of inflammation of the womb; was a patient of Dr. Sam Johnson, of Hudson, and was treated by him for several years at his sanitarium for chronic pelvic trouble and a chronic cough. Her first child was born dead, but was perfect and not apparently diseased. Later she was quite well for seven years. The second child was born six years ago, and has always been a healthy child. Present trouble commenced two years ago with pain in the region of the stomach and occasional attacks of vomiting and chronic soreness in the epigastric region. She has never had any symptoms suggestive of syphilis. Five weeks ago she first noticed a lump just above the umbilicus, continuous with the edge of the liver. Exploration on April 7, 1905, demonstrated a uniformly enlarged liver, covered with hard, white, irregular nodules, each about the size of a silver half-dollar. Fully thirty such nodules were seen and felt in both lobes, equally distributed in both the upper and under surface of the liver. No larger mass was found in the abdominal cavity. A section of one of these lobes was removed and the cut edges were united with catgut sutures. There was a very slight accumulation of ascitic fluid. This woman recovered promptly, and left the hospital improved under iodides, but with some ascitic fluid in the abdomen. She has gained fifteen pounds; ascitic fluid had decreased.

Dr. Hines and Dr. Rothrock report that the growth is a gumma.

PRIMARY CARCINOMA OF THE VERMIFORM APPENDIX.

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THE relative rarity of primary carcinoma of the vermiform appendix, compared with its rather frequent occurrence in other parts of the viscera, is sufficiently striking to make every case of sufficient interest to record.

History.—The vermiform appendix seems not to have been recognized as the possible seat of primary carcinoma, until Merlin, in 1838, first described a case. From this time it began to be referred to in literature, the older writers holding the opinion that neoplasms of this body were always secondary. Prien, in 1865, recorded one case, and two years later Rokitansky reported four cases of colloid tumor of the appendix. Up to 1895, but twelve cases had been reported, and out of this number one only had been histologically described; seven of the total number were discovered post-mortem. During the past ten years the number of cases reported has been greatly augmented. In 1903 forty cases were collected and reported to the New York State Medical Society. There are now on record about sixty-one cases that appear to be undoubted instances of primary carcinoma of this body; nineteen of these cases have not been confirmed by pathologic examination; there are also eight instances of primary sarcoma. While the classifications of the malignancy of some of the cases reported were undetermined by microscopic examination, they conform so closely to the description of those that have been studied, it is, I think, logical to place them in the same category.

Clinical History.—There is a striking absence of that chain of symptoms that goes to make up the picture of malignancy as usually met with. The most noticeable is the very

early age at which it has been found. The youngest was a girl of 12 years and the second was a girl of 15 years, while none seem to have been found in subjects past 40 years. Females are more often subjects of this malignancy than males. The patients are attacked with symptoms identical with those of the inflammatory type of appendicitis and the course of the attack throughout in no way differs from it except in the marked lessening in acuteness of the majority of the symptoms in by far the greatest number of cases, while on the other hand a few instances are recorded which serve to illustrate the possibilities of most acute symptoms. These are shown in a white girl 17 years of age, whose second attack came on after an interval of one year, with unusually severe pain, nausea and vomiting. With few exceptions the course of the attack is chronic, recurring at intervals of months or weeks; one of them extended over a period of seven years.

In but two instances has the neoplasm been associated with suppuration, and in one case of this type operation was done during the second attack, which was three weeks after the first had been complained of; the appendix in this case was acutely inflamed and the lumen contained pus.

In a number of instances the attack has been ushered in with no graver symptoms than those usually described as "acute indigestion" without any increase in temperature or pulse rate beyond normal, the extent of subjective symptoms in some cases being limited to pain only on deep pressure. The objective symptoms, however, in many of the cases, seem to be distinctly suggestive, there being noticeable evidence of impaired nutrition and assimilation, as shown in general anemia with some loss of flesh and pronounced lassitude, without any particular noteworthy change in the pulse rate or temperature, though the striking absence of classic constitutional symptoms, such as cachexia, has not even led to the suspicion of the nature of the disease before operation. This leads to the belief that malignancy of this organ *per se* does not carry with it any clinical symptoms that will define its true character. Probably the most misleading factor in the clinical

history is the varying periods at which recurrent attacks have been reported. One case, for example, a female aged 30 years, had recurrent attacks which extended over a period of seven years, while in another case, also a woman, 24 years of age, the illness dated but two days, while in still another case, that of a colored boy, aged 19 years, the only symptoms were repeated attacks of abdominal cramps.

Ætiology.—It seems probable, both from the study of the recorded cases as well as observations made by myself in this single instance, to regard these malignant changes in the appendix as secondary to the catarrhal form of inflammation, and that the transition from the simple inflammatory conditions to that of malignancy is not marked by that chain of symptoms usually described as belonging to primary malignancy.

Arguing, therefore, from analogy and from the well-known association of carcinoma with chronic inflammations, and commenting upon the rarity of tumors of the appendix, as compared with the frequency of its inflammatory affections, it seems logical to conclude that neoplasms of this organ are in a greater number of cases secondary to simple inflammation, especially should this be true in the milder forms of appendicitis, but it could not hold good in those acute inflammatory ones which culminate in abscess. In several of the recorded cases there was a definite stenosis which seems to have been a primary factor.

Symptoms.—The fact that carcinoma has been found in this body in persons dying from disease other than that of the appendix, clearly emphasizes the fact that neoplasms may exist in this organ without producing any symptoms directed toward it. Not only are the symptoms during the attack atypical but at no time throughout its existence does it develop any tangible evidence of its true nature. The attack is usually ushered in under precisely the same conditions and in like manner to that of the milder inflammatory forms. The patient will complain of diffuse pain, localizing itself to the right iliac fossa, nausea and vomiting, some soreness, most

pronounced to the right of the hypogastrium, rigidity and palpable tumor, with the usual history of recurrence and with intervals of freedom from symptoms, together with a decided variance in pulse and temperature record.

Gross Pathology.—The appendix, as in the ordinary inflammatory forms, is more often than not adherent at some point to the parietal peritoneum or to the intestines, more often at or near its tip. It is also greatly enlarged, dumbbell shaped, and at its distal end is fibrously hard, considerably enlarged and definitely circumscribed, so much so that it may readily be mistaken for a small fibroma; it cannot be shelled out, and in places the margins generally merge into the surrounding tissues. The cecum, the ascending colon, and the ileum have been found to show decided inflammatory changes. In a few cases the mesenteric glands were found to be of unusual size. So greatly enlarged were they in one case that the anatomic diagnosis was tuberculosis; the external surface of the neoplasm is generally very smooth and rather devoid of appearance of acute inflammation.

The appendix in one case reported, that of a girl 14 years of age, was twisted upon itself and firmly bound down, presenting two constrictions between which was a round nodular neoplasm about the size of a small marble, yellowish-white in appearance. Again the tumor may be small, acutely inflamed, and the mucosa deeply ulcerated, with the lumen of the appendix obstructed by the growth. In some cases it is more or less spheroidal, and in one instance it was found the size of a sickle pear and not unlike it in shape. In none of the cases has ulceration to the extent of perforation been noted.

Carcinoma of this part of the body seems to seldom, if ever, give rise to secondary deposits, as the literature does not record a single instance of metastasis. In all cases in which locations of the growth have been referred to they are shown to be situated at or within four or five millimeters of the tip. This observation holds good for more than half of them, indeed, in only eight or ten cases was it found near the cecal

end, while in one case only was it found that the neoplasm extended within the cecum. The original focus of this one was, however, demonstrated to have had its origin in the appendix. The size of the growth varied from 5 to 15 millimeters.

Diagnosis.—From the history of this condition it is obvious that the diagnosis cannot be made until operation and microscopic examination has been made. It is, however, just possible to strongly suspect the true character of the condition, if in a young subject there has been repeated acute attacks more or less insidious extending over a period of months or years, with decided loss of body weight and strength and with abdominal walls sufficiently thin to enable a fibrous hard tumor to be outlined, thought should be given toward its malignant nature.

Prognosis.—Every case operated has made perfectly normal recovery after the removal of the neoplasm, with restoration of the body weight and strength.

CASE RECORD.—The subject of this report, Patrick G., was an adult male aged 35 years with negative family history, referred to me by Dr. Stewart Runkle while suffering in his eighth attack, the first of which dated back 13 months.

The attacks during these intervals had recurred from 1 to 3 months apart, though the patient complained that he was never at any time since the first attack entirely unconscious of the existence of pain or discomfort in the right side of the abdomen and especially was this annoying after taking food. He also had with these attacks occasional vomiting, with periods of constant nausea, some elevation of temperature, with little or no increase in pulse rate, and obstinate constipation. The abdomen was distinctly scaphoid, the peristaltic wave was readily discernible through the thin abdominal wall with possibly slight convexity over the right iliac fossa.

Deep palpation was necessary before any tenderness could be elicited. A small hard pulsating mass could be readily outlined on deep palpation.

Urinalysis negative.

Operation July 30, 1907, under ether anaesthesia. The

abdomen was opened through a right lateral incision 2½ inches in length over the usual site. The omentum and intestines visible through the incision were apparently in every way normal, on passing beneath them a stony-like, definitely circumscribed mass could be readily felt, which was so firmly anchored to the parietal tissues directly across the external iliac vessels, that their pulsation transmitted to the finger, over the growth, an impulse at first not unlike that of aneurysm. There were no mesenteric gland enlargements, the surrounding tissues seemed entirely free from demonstrable inflammatory change. It required the most painstaking dissection with the fingers to separate the appendix which was adherent about 1¼ inches from its tip over the sheath of the vessel. Once freed it was readily brought out through the incision enabling the work of completing the operation to be done outside of the abdomen.

The gross appearance of the tumor is as follows: It was 1⅛ inches in length, beginning ¼ of an inch from the tip and extending toward the proximal end for a distance of 1⅛ inches, pyriform shape and 4⅛ inches in circumference, fibrously hard, giving to the sense of touch a distinctly fibrous feeling. The surface was smooth, and save for the site of adhesion to the vessel, was free from roughness. The various layers of structure composing the growth were firmly adherent one to the other down to the mucosa, this latter was in no way connected, though it had undergone an independent thickening so extensively as to stand out like a quill and almost as firm, the neoplasm could be withdrawn and replaced over it with the same ease that the piston of a syringe can be moved backward and forward within its barrel.

The proximal end of the appendix for about ¼ of an inch was in appearance entirely free from involvement and with the exception of the adherent surface the entire organ was smooth with a grayish-white or ground-glass color. The stump was ligated and pushed into the colon. The serous coat was sutured, and the abdominal incision closed. The recovery was uneventful. The patient left the hospital on the fifteenth day. A visit from him two weeks ago showed improvement both in body weight gain, and general nutrition.

Anatomic Diagnosis.—Chronic interstitial appendicitis.

Pathologic Diagnosis.—Infiltration carcinoma.

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HERNIA OF THE APPENDIX, COMPLICATED WITH APPENDICITIS.*

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NOTWITHSTANDING the subject of this communication is of but minor importance, the comparative infrequency of hernia of the processus vermiformis ought to justify the report of every case encountered.

It may be argued from the practical standpoint that it is of no importance to the surgeon or the patient to know beforehand what is contained in the sac of a hernia, that the operation is the same no matter what the condition. This is to be granted if we allow that the office of the surgeon has no aim beyond the ability to do an operation and dispose of the ordinary complications to be dealt with. But, as the principles of medicine are being more and more crystalized into a science, diagnosis naturally assumes a higher place in the mind of the surgeon, besides the world has always expected us to understand things which we undertake.

The diagnosis of hernia of the appendix will always be surrounded by difficulties, but bearing in mind that such a thing is possible and having a knowledge of the phenomena attending the condition, it will in most instances be possible to make a probable diagnosis.

When the processus vermiformis is inflamed in the sac of a hernia the clinical picture is that of strangulated enterocele minus the obstruction that usually attends the latter. In differentiating hernia of the appendix with inflammation from strangulated enterocele, it is well to remember that in the former the symptomatic syndrome is that of an inflammatory condition while the phenomena of obstruction predominates in

* Read before the Western Surgical and Gynecological Association at St. Louis, Dec. 31, 1907.

the latter. Levy lays stress upon pain felt about the umbilicus. In my own case there was great pain in the right iliac region. The form of the sac is alantoid, excepting when the appendix enters the canal doubled upon itself. An epiplocele may have the same appearance but is usually not so distinctly fusiform. The appendix in the hernial sac may be mistaken for an inflamed gland. The percussion note in both omentocele and hernia of the processus vermiformis is dull. No age is exempt from hernia of the appendix vermiformis, but it has been observed far more frequently in the aged and more often in the male sex. The appendix has been found more often in right inguinal than in crural hernia. This probably accounts for its greater frequency in the male sex. It has been found in left-sided hernia. The appendix may occupy the sac of congenital as well as that of acquired hernia.

Levy has raised the question as to whether inflammation of the epityphlon is the result of incarceration or whether the incarceration is due to inflammation and consequent swelling of the organ. He inclines to the belief that inflammation precedes incarceration.

It is said that an attack of epityphilitis predisposes to hernia of the appendix. The causes of appendicitis in the herniated organ are the same as the causes for inflammation in the organ *in situ naturalis*. It must be remembered, however, that trauma is infinitely more frequent in the herniated than in the appendix in its normal situation. As before stated, by far the greater number of cases of inflammation of the herniated appendix occur in aged patients. Levy accounts for this on the hypothesis that rheumatism predisposes to the formation of calculi and that diminished peristalsis in the aged prevents the appendix from emptying itself as rapidly as in youthful patients. This authority gives the causes of inflammation of the herniated appendix as traumatism, concretions, foreign bodies and digestive disturbances.

Perityphlitis may give rise to a serous effusion into the sac. Grave cases may be complicated with peritonitis or even

phlegmon. Perforation is frequent. According to Levy, one of the capital symptoms of appendicitis in the sac of a hernia is pain of a sticking and paroxysmal character always felt with greatest force in the same place. Sometimes there is a radiating pain directed from the inner inguinal opening toward the abdominal cavity. The tumor enlarges rapidly. Sometimes there is crepitation. The general manifestations are acceleration of the pulse and sometimes vomiting with elevation of the temperature. In the gangrenous form the temperature may be low. Levy makes the statement that vomiting is more frequent in simple incarceration of the appendix than in appendicitis. Peritonitis beginning in the herniated appendix may rapidly become phlegmonous.

In the differential diagnosis simple incarcerated hernia is first to be excluded. In epityphilitis hernialis as contrasted with strangulated enterocele the inflammatory phenomena predominate. Vomiting is less frequent and obstruction of the bowel is not often present, while the general appearance of the patient is not so grave. The diagnosis is always beset with uncertainties. Bichat observed the possibility of suppurative infection spreading from the epityphlon *in situ normalis* to the hernial sac and vice versa from the hernial sac to the general peritoneum. Bichat reports a case of his own and cites another from Körte in support of this statement.

Hydrocele may exist with hernia of the appendix and perforce with appendicitis hernialis. The wearing of a truss over a herniated appendix is fraught with dangerous consequences. Taxis is to be avoided under all circumstances.

Levy observes that the operation is to be determined altogether by the condition in which the appendix is found upon opening the sac. The appendix must be liberally exposed and resected if possible and the wound closed so as to cure the hernia. In the presence of phlegmon or suppuration this cannot be done any more than we would close the abdomen after an operation for suppurative appendicitis. In the presence of phlegmon or suppuration

in the hernial sac drainage must be employed. If an active phlegmon is encountered Levy counsels splitting the appendix and drainage until the sloughing and infection subside when the clean radical operation is done. Jonathan Hutchinson, Jr., who wrote upon this subject in the British Medical Journal, Oct. 21, 1899, holds about the same opinion.

One of the latest studies of this subject is the thesis of Jacquemin at Paris, 1905. He does not confine his reports to cases of hernia of the appendix alone, but includes all cases of hernia in which the appendix is present. This authority looks upon strangulation of the appendix as being very rare, excepting where the organ has prolapsed into the canal doubled upon itself. He agrees with all other authorities regarding the influence of old age on hernia of the appendix, but admits that no age is exempt from the accident. He mentions the fact that a hernia with painful crises or one with an unusual history ought to be suspected as containing an appendix. He calls attention to Demoulin's two cases of hernia of the appendix complicated with sacculated cysts, giving to the case the aspect of hydrocele of the cord. He likens appendicitis herniare to appendicitis in other unusual locations. The difficulty of diagnosis is increased because appendicitis in a hernia is not very different from what sometimes takes place in an ordinary hernia strangulated or inflamed. He regards the prognosis as good excepting in neglected cases. Jacquemin tabulates fifty-eight cases with six deaths, most of which were due to procrastination. He shows how the attendant may be misled by the insidiousness of the onset and the simulation of the disease to epiploitis.

John G. Sheldon published a paper on this subject with report of a case in American Medicine, 1903.

Bull and Coley observed the appendix in right inguinal hernia sixteen times in a thousand cases.

R. Peterson found the condition twice in ninety right hernias.

Hutchinson is responsible for the statement that an attack

of appendicitis predisposes to hernia of the appendix. He describes certain changes in the organ due to inflammation that facilitated its entrance into the inguinal canal. He states that a hernia containing an appendix is usually irreducible and tender on deep pressure. If the appendix is found in a normal condition at the operation he advises returning it to the abdominal cavity.

Report of Case.—H. W., German farmer, living near Yates Center, Kas.; he had been the subject of an inguinal hernia of the right side for several years. The hernia had often been painful. He had worn a truss. He was referred to me for operation by Dr. Maxon, of Toronto, Kas., August 17, 1907. He entered St. Francis Hospital the same day. According to the statement of the patient he had felt ill eight days before and had called a physician on the fifth day previous. This physician employed taxis persistently, and failing to reduce the hernia, told him to remain in bed and employ liniments. Three days later, feeling much worse, he summoned Dr. Maxon who recognized the condition and advised operation. The operation was done on the evening of the seventeenth day of August, the same day of admission to the hospital and the eighth day after the attack.

Inspection revealed a sausage-shaped mass in the right inguinal region extending from the external ring to the testes in the scrotum. Palpation showed the mass to be smooth, hard and tender on pressure. The tenderness extended to the right iliac fossa. The patient looked sick and was hiccoughing slightly. The bowels were not obstructed. An incision was made over the tumor, the upper and outer limb of which corresponded to the Bassini incision for hernia, and the lower part was extended over the cord into the scrotum. Upon opening the sac a small quantity of foul-smelling fluid escaped. The appendix, enormously enlarged and discolored and adherent constituted the contents of the sac. The walls of the sac were very much thickened and adherent to the cord and the testicle. Upon dissecting up the appendix the head of the caecum and the ilio-caecal junction formed an infundibuliform projection into the upper part of the canal so that the entire processus vermiformis lay in the sac.

The caecum and ilium were adherent about the entrance to the canal. The appendix was resected close up to the caecum and the sac of the hernia dissected away. As much of the wound as possible was closed, as in the Bassini operation, but, deeming it absolutely necessary to employ drainage, a cigarette the size of the little finger was carried down to the stump of the appendix, thereby making the closure of this part of the wound defective. The drainage was removed entirely at the end of a week and the wound healed.

J. M. ELDER, in the Montreal Medical Journal of March, 1901, reports a case of appendicitis herniare with perforation, in an infant seven months old, operated, with recovery.

BÄILLET, of Orleans, France, Revu de Chirurgie, page 294, 1904, reports the case of an infant of thirteen months on which he operated for appendicitis herniare with satisfactory result.

LEURET reports a case of appendicitis in the sac of a hernia in a child of three years.

BARTH, cited in Jahresbericht, 1902, page 811, reports the case of a woman of eighty years whom he operated upon for gangrenous appendicitis in the sac of a hernia eight days after the onset of the disease.

FRÄNKELS, Jahresbericht, 1902, page 811, reports a case of herniated processus vermiformis in which the organ contained a fish-bone penetrating the mucosa. Estienny, in the same volume and page, reports a case. Dutoit, on page 811, Jahresbericht, 1902, reports the case of a woman of fifty-two years with partial obstruction and gangrenous appendix, with rupture in the hernial sac.

SOULIGOUX, Jahresbericht, 1902, reports a case of appendicitis in congenital hernia with a knuckle of bowel.

RUTHERFORD reports a case of a woman of seventy-nine with appendicitis in a crural hernia.

GALTEN reports a case of appendicitis in the canal of a hernia.

KÖLLIKER reports a case of a sixty-nine year old woman with appendicitis herniare, Jahresbericht, 1902, page 807.

MOUCHET, Jahresbericht, 1901, page 623, reports a case where an old hernia manifested signs of strangulation which was found to be due to an inflamed appendix present in the sac.

GOEBEL, Jahresbericht, 1901, page 623, found a perforated appendix in the sac of an hernia.

STECHI, Supplemento Al Policlinico, April 14, 1900, reports a case of appendicitis herniare.

CALVINI, Clinica Chirurgica, 1902, No. 1, reports a case with operation and recovery.

COMINACINA, Supplemento Al Policlinico, 1902, No. 34, reports a case of appendicitis herniare with peritonitis-operation and recovery.

WULFF, page 757, Jahresbericht, 1902, reports a case of appendicitis herniare. Mires on the same page reports a case, while two cases are reported by Condamin. Racovicieano reports the case of a man of sixty-five with suppurative orchitis with appendicitis in the hernial sac. Quenu, Jahresbericht, 1905, page 599, reports the case of a woman of forty-two in which the appendix was strangulated in a hernia. The portion of the appendix distal to the strangulation was in a state of inflammation: operation and recovery. Bichat reports a case cited on the same page with fatal termination. I do not believe any of these cases were included in the 116 tabulated by Bajardi and Briancon.

ENORMOUS ENDOTHELIOMATOUS CYST OF THE GREAT OMENTUM.

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TRUE cyst of the omentum is of exceedingly rare occurrence, in fact, an exhaustive search of the literature has brought to light but nineteen cases. The Index Catalogue and the Index Medicus in the library of the Surgeon General's office contain thirty-four reported cases, but these have to be very carefully sifted out in order to obtain the cases of what I term true cyst of the omentum,—*i.e.,* cyst of the omentum itself. Twelve of these on careful analysis prove to be cysts springing from the omentum; attached to it by a pedicle or otherwise connected with it.

True cyst of the omentum is a cyst *within the cavity of the omentum,* lies entirely within its folds, and is not external to it in any way. A cyst springing from the omentum by a pedicle or connected to it in such manner as to show that it is clearly of it, is undoubtedly an omental cyst, but of an entirely different type from that serving as the basis of this paper. In fact, up to the present time, no one seems to have separated the cysts occurring *within* the cavity of the great omentum into a class by themselves as distinct from those wholly or partially *external* to the omental pouch. That this distinction should be made seems imperative, as the etiology of the one can be very distinct from the etiology of the other, as witness that of my case in which an omental endothelioma within the omental pouch was the beginning, and one of the external type in which an escaped ovarian cyst that had attached itself to the external border of the omentum is supposed to be the origin.

True omental cysts therefore are of sufficient rarity to

merit attention whenever found. Fort (ANNALS OF SURGERY, 1907) reports a case which he considers to be the twenty-third on record, but according to my researches he has evidently admitted four cases not entitled to be classed as of this type, and his is really the nineteenth; the case I shall report making the twentieth.

The condition was called to the attention of the medical profession in 1851 by Gairdner, who reported the first case, but advanced nothing to show the etiology. Later, in 1885, Doran [1] asserted that dermoid cysts of the omentum were really ovarian cysts that had become separated from their pedicles, and mentions the case of a small, soft, white body found adherent to the posterior aspect of the omentum with a pedicle about four inches long which proved to be the left Fallopian tube, the soft white body being the ovary. He thinks the ovary had become displaced; the stretched tube and ligament would in such a case be bound to atrophy and the tumor get its blood supply from the omentum. He admits that this could not always be the case, as dermoid abdominal tumors have been met with in males for which he advances no explanation. Jacobi,[2] writing of omental tumors as a class, says: "Nearly all of them, perhaps all, are of lymphatic origin, and result either from dilatation of lymph veins or from a cystic degeneration of lymph-nodes." Rokitansky [3] describes such. Weichselbaum [4] reports a case of the first variety and Sabourin & Le Dentu [5] another that contained chyle. A case of the second variety is reported by Werth [6] and by Duearkler.[7] Werth's case was a cyst as large as a child's head, rising from a segment of the mesentery of the small intestine (singularly enough, much difficulty was met with at times in telling whether the author meant cyst of the *mesentery* or of the *omentum*). There were no formed elements. Rokitansky explains it as a cystic degeneration of lymph-node caused by a primary obliteration of vasa efferentia, while the entrance of chyle not being impeded must lead to retention and dilatation. A similar cyst has been described by Eppinger,[8] who erroneously supposed it to be a dermoid, three of which have been

reported, one each by Waldy [9] and by Lipscher [10]—both external to but attached to the omentum; while Bonfigli [11] reports one contained within the cavity of the omentum itself.

The accompanying abstracts give a brief outline of each case of true omental cyst, while Table I, arranged in chronological order, is open to considerable analysis (fractional percentage not given).

ABSTRACTS IN BRIEF OF REPORTED CASES.

CASE 1.—GAIRDNER. The cyst was found beneath the anterior layer of the great omentum in a woman dying unexpectedly, having a large fibroid uterus. It consisted of a large closed sac, and contained a transparent, colorless serum.

CASE 2.—SIMON. Male, 44 years of age. Tumor could be felt in the right hypogastric region simulating a distended bladder. This tumor dated twelve years back but had never been painful. Catheterization brought only a little urine, and the catheter could be felt impinging against a resistent mass. Death five days after admission. Autopsy showed a tumor in the folds of the great omentum extending from the stomach to the upper part of the pelvis. It had a distinct thick-walled capsule, and contained much coagulated blood. It could be traced to no abdominal organ.

CASE 3.—JONES. Male, aged 58; farmer. Had always enjoyed excellent health. First complained two years previously of pain in the back and frequent micturition, with a feeling of weight and oppression in the bladder. He was relieved of these and not seen again for a year. Distressing nausea and vomiting with other dyspeptic symptoms were now complained of, together with renewal of the old symptoms. A small tumor was made out in the left hypogastric region which grew rapidly, and the man died. Autopsy: An enormously enlarged abdomen from ensiform cartilage to pubes; adhesions everywhere. A large cyst was found evidently originating in the omentum. It contained a broken-down sarcomatous mass weighing 15 pounds; also about 3 gallons of fluid. Lymphatic glands not enlarged. Tumor was an alveolar sarcoma.

CASE 4.—DORAN. Patient was a woman aged 58. Had suffered for many years from symptoms resembling cystic ovarian disease. Two years previously cyst had ruptured and filled again; had been tapped several times. Large cyst was found at operation intimately adherent to the parietal peritoneum near the umbilicus, and was entirely within the omentum. Recovery.

CASE 5.—GOODING. Girl, aged 19. When 18 years old she first noticed a lump the size of a hen's egg low down in right iliac fossa, which was painful chiefly at menstruation. It grew in size gradually upward. At time of observation it was as big as a cocoanut and reached

TABLE.

	Date.	Reporter.	Sex.	Age.	Treatment.	Result.	Reference.
1	1852	Gairdner, W. T.....	Female	Adult	None	Death	Tr. Path. Soc., Lond., (1850-51) 1852, iii, 374.
2	1858	Simon, E.	Male	44	None	Death	Bull. Soc. Anat. d. Paris, 1858, xxxiii, 30.
3	1881	Jones, Talbot	Male	58	None	Death	Med. Rec., N. Y., 1881, xix, 600.
4	1882	Doran, Alban	Female	58	Removed	Recovery	Trans. Obst. Soc., Lond., 1882, xxiii, 164.
5	1887	Gooding, J. C.	Female	19	Removed	Recovery	Lancet, Lond., 1887, i, 311.
6	1890	Wells, Spencer.....	Female	4	Removed	Recovery	Brit. M. J., 1890, i, 1362.
7	1893	Cazin, M.....	Male	48	Removed	Recovery	Bull. Soc. Anat. d. Paris, 1893, lxviii, 312.
8	1896	Erdheim, S.	Female	22	Removed	Recovery	Wein. klin. Rundschau., 1896, x, 131.
9	1896	Marfan, A. B.	Female	2½	Removed	Recovery	Press Med., Paris, 1896, 133.
10	1896	Jessett, F. B.	Female	Adult	Removed	Recovery	Brit. Gynaec. Jour., 1896-7, xii, 156.
11	1897	Hearn, W. J.....	Male	8	Removed	Recovery	ANNALS OF SURGERY, 1897, xxv, i, 703.
12	1898	Braithwaite, J.....	Female	4	Removed	Recovery	Lancet, Lond., 1898, ii, 1472.
13	1901	Jacobi, A.....	Female	7	Removed	Recovery	Trans. Ass. Am. Phys., 1901, xvi, 232.
14	1901	Marsh & Monsarratt.....	Female	1 yr. 8 mo.	Removed	Recovery	Brit. M. J., Lond., 1901, i, 511.
15	1902	Catman, H. H.....	Male	21	Removed	Death	Brit. M. J., Lond., 1902, i, 1267.
16	1903	Schramm, H.	Female	1	Removed	Recovery	Zentralb. f. Chir., 1903, xxx, 564.
17	1903	Boyd, S.....	Male	11	Removed	Recovery	Clin. Jour., Lond., 1903, xxi, 306.
18	1905	Young, W. McG.....	Female	9½	Removed	Recovery	Lancet, Lond., 1905, i, 157.
19	1907	Fort, R. E.	Female	2½	Removed	Recovery	ANNALS OF SURGERY, 1907, xlv., iii, 382.

to the umbilicus. Diagnosed as ovarian cyst with a long pedicle. At the end of two years she began to suffer with occasional vomiting after meals, and considerable shooting pains in and about the tumor, and tumor had enlarged very much. Operation disclosed a cyst densely adherent to parietal peritoneum, and embedded in the folds of the omentum; there was no pedicle. Some months previous to discovering the lump she had received a severe blow in the stomach. Recovery.

CASE 6.—SPENCER WELLS. Female, aged 4. Had large abdomen since early infancy that has increased in the last year. Diagnosed ovarian cyst. Operation showed a thin-walled cyst of omentum in the right iliac fossa, adherent to abdominal wall, cæcum and appendix. Recovery.

CASE 7.—CAZIN. Male, aged 48. First noticed the tumor the previous year which had developed without any history of trauma, and had gradually enlarged. Had been tapped several times, and 7½ liters of a bloody fluid withdrawn. Diagnosed as cyst of pancreas. Operation showed it to be a cyst of the great omentum, and adherent to large intestine. Recovery.

CASE 8.—ERDHEIM. Female, aged 22. Five years previously the tumor had apeared without cause, and had reached its present growth in fourteen days according to patient's account (this is questioned). No traumatic history obtainable, but has often done heavy lifting. Diagnosis: Ovarian cyst. Operation disclosed a bluish, transparent cyst wall adherent over a wide area, and covered with omentum. Cyst required opening and evacuating before it could be removed. There was no connection with any of the pelvic organs. Tumor reached from transverse colon to the bladder. Recovery.

CASE 9.—MARFAN. Female, 2½ years. Family history negative. Mother had noticed that abdomen had always been large, and at the age of 15 months it began to increase in size, and has been steadily enlarging for a year. No disturbance has been manifested in the physical condition until toward the last few weeks, when emaciation set in. Aspiration brought a blackish, hemorrhagic liquid—about two liters altogether. This had gradually reaccumulated. Operation revealed a cyst containing a large quantity of fluid. It was a multilocular cyst within the folds of the great omentum and had a pedicle. Recovery.

CASE 10.—JESSETT. Female; adult. Case was diagnosed as ovarian cyst. Operation showed a cyst within the folds of the omentum and adherent to upper part. It contained a quantity of cholesterin. Recovery.

CASE 11.—HEARN. Male, aged 8. At birth his physicians noted that the abdomen was markedly distended. This disappeared at six weeks and was not particularly noticeable again until 6 years old, when the abdomen again began to distend. In the meantime he enjoyed good health. Of late, abdomen has increased rapidly in size, the chief difficulties being weight, dyspnea and frequent micturition. The abdomen was enormous, measuring 44 inches in circumference. An omental cyst was suspected, owing to lack of symptoms of other troubles. Operation discovered a cyst containing a dark greenish fluid and many other cysts. After evacuating a number the mass was drawn out and found to be attached to the

great omentum between the folds of which it had developed; it weighed about 50 pounds. Recovery.

CASE 12.—BRAITHWAITE. Female, aged 4. Measured 22¾ inches at level of umbilicus; this had increased during two months. Tumor was found to be entirely within the folds of the great omentum and with the exception of adhesions to the intestine was easily removed. It contained 3½ pints of fluid. Recovery.

CASE 13.—JACOBI. Female, aged 7. Four years previous to seeing patient abdomen began to swell and the child lost flesh. A diagnosis of tubercular ascites was made and two quarts of a clear, slightly bloody serum was drawn off. After two years the swelling was again in evidence and was tapped a second time. Operation disclosed a very thin-walled cyst, multilocular, containing about two quarts of fluid. It was incorporated in and involved the greater part of the great omentum; it narrowed into two pedicles as it approached the stomach. Recovery.

CASE 14.—MARSH and MONSARRATT. Female, aged 1 year, 8 months. Abdomen was noticed to be enlarged about four months previously, but there was no complaint of pain. Abdomen measured 23½ inches just above navel. Was tapped four times. Operation showed a thin-walled, multilocular cyst springing from omentum of greater curvature of the stomach, and entirely enveloped in omentum. It contained about ten pints. Recovery.

CASE 15.—CATMAN. Male, age 21. Three months previously had received a severe blow in the abdomen from the shaft of a cart while riding a bicycle. Accident kept him from work for five weeks. Since then has complained of a lump in his stomach. Operation disclosed a tumor connecting with an opening into the stomach. Tumor was a blood-cyst between the layers of great omentum. Death.

CASE 16.—SCHRAMM. Female, aged 1 year. Enlargement of abdomen had been observed four months previously; was growing larger. Abdomen measured 91 cm. in circumference at umbilicus. Tumor mass could be easily outlined. Diagnosis: Tubercular peritonitis, with fluctuating exudate. Operation disclosed a cyst occupying entire omentum, more a conglomerate mass of cysts. It was removed entire. Recovery.

CASE 17.—BOYD. Male, aged 11. Family history negative. Always felt well until January of the present year (1903). His trouble began with vomiting, loss of appetite, and inability to run about because he felt so tired. His abdomen began to swell at this time and has increased steadily in size. Has had constant pain in lower abdomen, but never of a severe nature, and has lost much flesh. Diagnosed as tubercular peritonitis; also cyst of the left kidney. Operation disclosed a large thin-walled cyst covered by and occupying the cavity of the great omentum. Twelve pints of greenish-brown fluid removed. Was attached to the pancreas, but did not appear to spring from it. Recovery.

CASE 18.—YOUNG. Female, aged 9½. Body had always been full from infancy, and was enormously distended from beneath the costal arch—which was bulged—to the symphysis. At operation a thin-walled cyst was found containing other cysts. It involved the anterior layers

of great omentum, and was adherent to the stomach; 32 pints of fluid were removed. Recovery.

CASE 19.—FORT. Female, aged 2½ years. Had had two attacks of acute indigestion, each lasting several days. Abdominal enlargement was noticed by the mother eighteen months previously. Child measured 28 inches at level of umbilicus. There were no symptoms other than dyspnea. Operation revealed a dark glistening tumor within the folds of the great omentum. Recovery.

THE FOLLOWING CASES HAVE BEEN REPORTED AS OMENTAL CYSTS, AND WHILE SUCH, DO NOT COME WITHIN THE MEANING IN THE SCOPE OF THIS PAPER.

1. GAY. (Ext. f. record of Bost. Soc. f. Med. Imp., 1859, iii, 248.) Female, age 46. Is not at all certain what he found, but in addition to opening the abdomen and evacuating a large amount of fluid, he drew up into the wound a number of tumors firmly connected with omentum, of a firm "scirrhus" hardness, and firmly fixed in the omentum. He feared to remove them. Recovery.

2. THORNTON. (Brit. M. J., 1882, ii, 1243.) Adult; female. A small multilocular cyst the size of a cherry was removed during ovariotomy. It was attached to the lower border of the great omentum by a small pedicle. He thinks it was an ovarian cyst owing its origin to cell infection.

3. THORNTON. (Brit. M. J., 1882, ii, 1243.) Female, 47 years old. Tumor the size of a cocoanut with a thick sac attached by thick pedicle to the omentum. It lay under the right border of the liver; it was a mixed sarcomatous cyst. Recovery.

4. ORMSBY. (Med. Press & Circular, Lond., 1883, xxxv, 258.) Female, aged 26. Had had large abdominal tumor for six years, and measured 54 inches at the umbilicus. Operation disclosed a multilocular tumor containing fluid so thick it would not run through the trocar. It sprung from the great omentum.

5. EDEBOHLS. (New York Jour., Gynæc. & Obst., 1893, iii, 614.) Female, aged 37. Had noticed symptoms of enlargement for eight months previously. Tumor had a distinct cyst wall which was gangrenous over a considerable area. It was a mono-cyst, and contained a chocolate-colored fluid. It had no connection with any structure, excepting the omentum to the lower border of which it was attached by a firm pedicle.

6. KEEN. (ANNALS OF SURGERY, 1898, xxvii, 220.) Male, age 48. About fifteen months before had noticed a lump a little larger than an egg in the lower right segment of the abdomen, which gradually increased in size, of late rather rapidly, and finally filling the abdomen and causing much respiratory trouble and frequency in urination. Had never caused any great pain. Had no gastric or intestinal symptoms, excepting from compression of the bowels. Had lost 30 pounds in weight. Trochar at operation brought about 3 pints of dark, bloody fluid. On the right side the tumor was free from adhesions, excepting to the omentum, but on the left side it was intricately adherent to the omentum and the stomach was spread out fan-shaped over its entire surface. It was a mixed-celled sarcomatous cyst. The danger of tapping such a cyst was well

illustrated, as had it been tapped in the upper part the stomach would have been perforated, being spread out over it.

7. Rose. (King's College Hosp. Rep., (1896–7), 1898, iv, 101.) Adult; female. Had been operated upon for a multilocular ovarian cyst. About a fortnight after the operation she complained of pain in the right loin. Examination disclosed a tumor occupying the right lumbar region and extending up under the costal arch. Diagnosed as a renal tumor. At operation a multilocular cyst was found connected to the omentum by narrow adhesions. Recovery. Rose thinks it originated in the right ovary and became detached through twisting of the pedicle.

8. Mauclaire and Desarnaux. (Bull. d. Mem. Soc. de Anat., Paris, 1902, lxxvii, 683.) Female, aged 52. First began to complain five months previously and was treated for gastric troubles, complicated with the uterus. There was some emaciation, obstinate constipation, and a prominence in the subumbilical region the size of an adult's head. A provisional diagnosis was made of cancer of the head of the pancreas, also of a cystic tumor. Operation, with death six hours later. Autopsy showed a probable cancer of head of pancreas, with hemorrhage into the omentum from a pancreatic vessel.

9. Schwartz. (Gaz. de Osp., 1902, xxiii, 764.) Female, age 43. Family history negative. Never remembers having been ill; has had several abortions and was forced to take to bed because of pains in left side. Present trouble dates back eight months, when there was sharp epigastric pain and vomiting, and she noticed abdomen beginning to enlarge. Her physician found a tumor in the epigastric region. This was aspirated twice, getting some fluid. Tumor extended from ensiform cartilage to near umbilicus. Diagnosis: Either echinococcus cyst of liver or independent of it, or might be a cyst of pancreas, or from stomach and transverse colon. Operation showed cyst completely adherent to lesser curvature of stomach. Cyst wall was stitched to abdominal wall and aspirated two days later and as much of cyst wall cut off as possible. Recovery.

10. Lance and Lecéne. (Bull. de Mem. Soc. de Anat., Paris, 1903, lxxviii, 400.) Female, aged 60. Had noticed presence of tumor for four years, which had gradually increased to large size, until abdomen was the size of the uterus at full term. Diagnosis: Multilocular ovarian cyst. Operation revealed seven cysts containing yellowish fluid and some blood. Mass was easily removed. It was free in abdomen and had only two slight adhesions. It contained ten liters of liquid, and had a distinct capsule. Recovery.

11. Matthews. (Brit. M. J., Lond., 1905, 1642.) Male, aged 8. Following attack of measles nine months previously he complained of pain in left side. There was gradual distention of the abdomen. Greatest circumference measured 27 inches. There was no history of any previous illness or trauma. The tumor consisted of a large sac and contained 6 pints of dark-brown fluid. It was attached by a thick pedicle of omentum to transverse colon.

12. Bidwell. (Brit. M. J., Lond., 1905, ii, 806.) Male, aged 62.

Had always been stout, but recently his abdomen had begun to enlarge and was enormously distended. It was tapped, and 4 gallons of blood-stained fluid withdrawn. Afterwards a hard mass could be felt, and was diagnosed altogether five times. Diagnosis: Malignant disease of the omentum. Operation disclosed a cystic tumor that sprung from the omentum by a distinct pedicle. It contained a growth which was not examined. Recovery.

Of the nineteen patients, nine were adults—47 per cent., while ten were below ten—52 per cent. (One of eleven years is included for convenience.) This is too nearly an even division to lend much weight to the theory of congenital origin. As a matter of fact seven cases only—36 per cent.; those of Wells, Hearn, Marfan, Marsh & Monsarratt, Young, Schramm and Fort are clearly congenital by their histories, while those cases occurring in adults (47 per cent.) were probably not congenital at all. It would seem, therefore, quite likely that while some cases are undoubtedly congenital, others may be acquired in later years through traumatism or other causes, just as we have hernia, hydrocele and many other affections both congenital and acquired. Certain it is that six, cases 2, 3, 5, 7, 8, 15, specifically state or intimate that they felt perfectly well up to the time of discovering the tumor, while three, cases 5, 8(?) and 21 are traceable to trauma—(my own making four).

One very striking thing shown is the great frequency of occurrence in females, 13 cases—79 per cent., as against six in males—31 per cent. This same preponderence being found also in the external variety of omental cysts. It has been suggested that some of these have originally been ovarian cysts that have become separated from their pedicles and attached to the omentum. This is not at all unlikely in cases occurring in females and in those of the external variety, but can certainly not be said of those found in males.

The operative results have been especially brilliant. Sixteen cases were operated upon with one death, a mortality of 6 per cent. the oldest case being 58 years, the youngest 1 year of age.

The histological characteristics and the contents of these cysts are of such a wide variety that it is hard to suggest a

distinct etiological factor. Lymph, chyle, serum and blood have all been reported; my own contained an enormous blood clot, and thirteen of the nineteen cases mention a distinct capsule or the record is so worded as to leave little room for doubt of its existence.

My own theory regarding the etiology of my case and all similar cases where a growth is involved, is, that there was first the endothelioma of the omentum; by inflammatory action the two surfaces of the omentum became fused together, forming a closed sac within which grew the endothelial cyst. The blood clot contents of course being derived from repeated hemorrhages from the parent tumor.

My case is as follows:

Ada D., colored, married, age 50. About one year ago she noticed a swelling in the lower abdomen which gradually increased in size until the abdomen became enormous, the distension extending up under the costal arches causing them to bulge, and interfering very materially with respiration. Constipation was also a marked feature. So far as she knew nothing had ever happened to her as a possible cause other than repeated blows in the abdomen, given by a small child butting its head into her while running at full speed as a pastime. At times the tumor pained some, but not to any great extent; and she had always enjoyed good health up to the appearance of the tumor. Her principal trouble was from the great weight, difficult breathing, frequent micturition and constipation from pressure. Examination showed the abdomen enormous in size and distended apparently almost to bursting. In the prone position the swelling began from behind the ensiform cartilage and costal arches; breathing impaired. Tumor fluctuating. Vaginal examination negative. Diagnosis: multilocular ovarian cyst.

Operation.—Incision through right rectus. Abdominal wall very thin, not over one-quarter inch, including all layers. Immediately on opening the peritoneum the tumor presented itself, dark bluish-black in color. A trocar plunged into it brought away about half a pint of grumous fluid. There was also a small quantity of ascitic fluid external to the tumor. The tumor was semi-solid and occupied the entire abdominal cavity except the deep pelvis. No connection whatever with uterus, ovaries or

tubes, and the entire mass was completely enveloped within the cavity of the great omentum, and lay anterior to the intestines. Veins of the omentum enormously distended, many as large as a lead pencil, formed a network or mesh completely enveloping the tumor mass, and very little of the omentum itself remained,—only the network of veins,—most of it evidently having been absorbed by pressure. The transverse colon was pushed down almost to the symphysis pubis. There were very few adhesions, and these were mostly quite flimsy and easily broken down. There was one very firm fibrous band attached to the abdominal wall anteriorly, and another tough one almost like a pedicle, to the stomach, causing a suspicion that the tumor sprang from an old gastric ulcer, but there was nothing in the history to warrant such a finding, and later this was found to be only a dense adhesion. The wall of the stomach was slightly torn in the external coats in separating this adhesion and was whipped over with catgut. There were also some dense adhesions to the mesocolon and of course everywhere to the omentum. In fact very little of this structure was saved, being ligated in bunches and divided in order to turn out the tumor, which, owing to its large size and solid contents was impossible. Accordingly the sac which was very thick and tough was opened disclosing a number of smaller cysts inside, and enormous quantities of blood clot, many handfuls of which were removed before it was possible to pull the tumor through the incision. There was no pedicle.

After removal of the tumor the liver was found much atrophied from long-continued pressure, pale and anemic, and containing several small retention cysts which were punctured. Many bleeding points required ligation where omental adhesions had been ruptured, and a rent in the mesocolon was sutured. Salt solution was given under the breasts and about a quart sewed up in the abdominal cavity. Morphine-hyoscine-strychnine anesthesia was used supplemented with a few whiffs of chloroform.

The patient reacted well from the operation; there was no shock, and she made an uninterrupted recovery.

The specimen as removed weighed eight pounds,—which was simply the sac and parent tumor, it did not include any of the blood clot. Before opening, the tumor probably weighed not far from forty pounds. It sprang from the omentum between the stomach and transverse colon.

FIG. 1.

Section from author's specimen. × 225.

PATHOLOGICAL REPORT, BY DR. JOHN S. HEATE.

With reference to the tumor of omentum case of Dr. Hasbrouck, microscopical examination shows it to be an endothelioma, or according to the more modern classification a mesothelioma.

The cells comprising the tumor are in general epithelial-like in structure, some having considerable protoplasm and in shape polygonal, round, cuboidal or fusiform, according to location and pressure. They also show a disposition to arrangement in columns encircling the blood vessels, from which they appear to have their origin. The fibrous stroma is very vascular, resembling some forms of angio-sarcomas which, taken with the intimate relation between the cells and stroma, places it with the connective tissue type of tumors, and this type of cells, their arrangement and the organ involved makes it most probably an endothelioma. (Fig. 1.)

My case appears to be unique in two particulars: 1. Its character, originating from an endothelioma of the omentum. 2. The contents, an enormous blood clot. (Case 2, Table I, might possibly come under this variety.)

Symptomatology and Diagnosis.—Very little is to be gained from the symptoms leading to the diagnosis of the disease. In some cases there is pain of more or less intensity, but usually not very severe. Gastric disturbance—nausea, vomiting and anorexia are often present, but not in all cases; weight and dyspnœa are complained of, and bladder symptoms and constipation from pressure. Emaciation occurs after much enlargement has taken place. In my own case there was nothing whatever to point to a diagnosis. From all of which it would appear that there are no specially characteristic symptoms,—the condition merely simulating the other forms of cystic growth of the abdomen.

It is not strange therefore that one fails to make an exact diagnosis, as the condition simulates such a wide variety of disorders. In fact, almost everything else has been diagnosed; lipoma, ascites, ovarian cyst, aortic aneurysm, hydatid cyst of the liver, cyst of urachus, cyst of mesentery, pancreatic cyst, and encysted and tubercular peritonitis have all been named. It is doubtful if the diagnosis can be accurately determined from the limited amount of data usually at hand and the extremely rare occurrence of cases, and the condition is

much more apt to be discovered at operation than determined beforehand.

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THE INCONSISTENCIES OF THE GAUZE PACK.*

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More and more each year, since I began the practice of surgery, there has grown in my mind a conviction that there are certain marked inconsistencies connected with the use of gauze, as ordinarily employed in our work. Let me say at the outset that I do not wish to be understood as condemning gauze packing in general. I am inclined, however, to doubt whether the introduction of gauze into surgical practice was as much of a blessing as it at one time appeared that it would be. Outside of its service as a dressing and sponge material, to which no legitimate objection can be offered, gauze is employed in surgery for: first, draining recent or granulating wounds, and packing sinuses, cavities, *et cetera:* and second, walling off septic matter while performing abdominal operations.

1. Methods of drainage were in general use before the principles of drainage were well understood. We drained before we knew why we drained. In the search for an ideal drain numerous materials have been employed. A strip of gauze was simply the means of applying to a wound the law of capillary attraction. Since it is a common experience that gauze frequently fails to drain, tubes of rubber or of other material have long been in use, while more recently combinations of rubber and gauze (split-tube and cigarette drains) are being substituted. The call for improvement in the manner of draining has come, because the object for which the gauze is employed is so seldom obtained. Instead of facilitating the removal of wound products, gauze, in fact, acts as a successful stopper to the outlet of the wound and impedes the natural outflow from it.

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The one thing to be desired in all drainage is the patency of the wound orifice, in order that the objectionable contents may escape. Whatever prevents this escape, either by clogging the cavity or by obstructing the opening, must be undesirable. Herein lies the chief indictment against the gauze drain, for both offences can be laid at its door. Not all the trouble, however, is due to the gauze; much of the mischief is done by the surgeon. As usually employed there could be no more efficient plug than the stereotyped gauze packing that is placed in a wound. Purulent discharges are not drained, but the gauze becomes soaked with them. The wound drains better when the packing is removed. In the instances in which the gauze pack is applied to arrest hemorrhage, the end to be attained is just the opposite of drainage and the gauze should be put in as tightly as possible. To express it tersely, when intended for a drain, gauze should be inserted after the manner of a lamp-wick; when used for hemorrhage, it should be packed in like wadding with a ram-rod.

The edges of a wound from which an unprotected tightly-fitting gauze tape is protruding begin to contract around it and became adherent to it in a few hours. Unless the secretion be of a very thin consistence no capillarity will be present and for this reason discharges which would easily be evacuated are held in by the very means employed for their removal. In shorter terms, a tight drain is worse than none.

To those who have seen the light and who are now using rubber tissue or tubes (and often no drainage at all where formerly they thought it indispensable), this arraignment of gauze may seem superfluous, but I am convinced that many surgeons do not yet appreciate the plain principles here involved. There is a field for the use of gauze in packing sinuses, fistulæ and granulating wounds, so that healing may take place slowly from the bottom. Even here, however, the packing should be loosely done and the gauze preferably saturated with some substance which will prevent sealing of the wound edges. But it is as a drain that the disadvantages of gauze constantly force themselves upon us. While some of us are probably not drain-

ing any more or less frequently, we are draining more judiciously and with clearer conceptions of why we drain. An eminent American surgeon said recently as he left a large wound open and packed it with gauze: "If I drain, this patient is sure to get well; if I close up, he may possibly die—therefore, I drain." Now, as far as my knowledge goes, I am not sure that I ever saved or lost a patient because I did or did not use a gauze drain. Apparently the matter is not always susceptible of proof on either side. Some will persist in the use of gauze drains and, in the event of disaster, console themselves by believing that it is better to have drained and lost than never to have drained at all. There are drains that do not drain and those who get good results with them are merely proving that no drainage was needed.

There is no controversy as to the object in view in the treatment of open wounds. If the surgeon be sure that the wound, unaided, will free itself satisfactorily from all deleterious fluids, he will insert no drain—and it is well. If, on the other hand, the surgeon be sure that the wound needs assistance, he will resort to artificial drainage—and it is well. Success follows both modes of treatment, and to some it may seem that it makes no difference whether we drain or do not drain; but surely to none can it seem a matter of indifference to employ or not to employ, for the purpose of drainage, a material like gauze tightly packed into a wound. It would appear, further, that all must recognize the importance of settling definitely the question whether a strip of gauze inserted loosely as a wick will continue to drain efficiently after it becomes saturated with pus or whether it will then cease to drain, thereby necessarily interfering with the natural discharge of fluids from the wound.

2. When we come to consider the use of gauze to wall off septic matter while operating within the abdomen, we approach a question which vitally concerns the work of every surgeon. I realize that I shall call attention to some matters not heretofore discussed and say some things which may be productive of much argument, and perhaps refutation of my opinions. My

criticisms of the method in vogue are derived entirely from observation of the work of others. For my part I have never fallen into the routine way of packing off with gauze in the abdominal cavity. There always seemed to me some well-founded objections to it and, as my mortality did not seem to be effected by omitting it, I continued to do without it. But, I believe that the majority of operators are in the habit of placing large pads or even huge rolls of gauze in the abdomen after making the incision in pus cases or suspected ones. This is done in order that there may be a protecting wall around the purulent area to ward off infection from the clean portions. To accomplish this end there must be a long incision, the viscera are subjected to unnecessary manipulation, and very likely the uninfected regions will be constantly in contact with pus-soaked gauze. Capillarity exerts its influence also, here as elsewhere, and, when one end of a gauze pad is in contact with purulent discharge, the whole piece will become soaked and the other end soiled, if sufficient time is allowed.

A glance at the accepted plan of introducing gauze for walling off will indicate its inconsistencies and even its dangers. At least, it may not be difficult to show its uselessness. When a free suppuration is present in the abdomen, the septic material will generally be seen at the incision, as soon as the cavity is opened, and, if an attempt is made to pack it off with gauze (though all the pus possible be first sponged away), the only sure thing done is the carrying of infectious products by means of the gauze to distant clean areas, there to remain during the operation as an added source of danger. In the case of an abscess already localized by nature, if the gauze might seem to be of use, it is when the shielding wall is, for some reason, intentionally broken through; but here it is open to the same objections as have just been mentioned. The truth is, exposure of peritoneum to gauze saturated with pus is just as pregnant with danger as the presence of pus itself among the intestines. Besides, the gauze pack, as a foreign body, interferes with the normal resisting power of the peritoneum. The superior tolerance of this membrane for infection and traumat-

ism explains why the mortality in abdominal surgery is not greater, particularly when the pack is used. Certainly every opportunity is afforded to extend infection by pushing rolls of gauze through collections of pus into healthy parts or by packing around abscesses with an artificial wall of gauze which becomes steeped in septic matter. And, finally, a glaring inconsistency is seen in the removal of the packs with already contaminated hands and in the unavoidable rolling upward of intestinal coils against the purulent area.

Perhaps some one will say that these observations may appear to be just, but that the conditions as described do not exist. That may be true of individual surgeons; but is it not probable that these things are being done over and over without a thought as to whether they are necessary or harmful? And is it not evident that many of those, who believe they are walling off, are not doing it? Some one again may ask: if these objections against the gauze pack are to be sustained, what method shall we employ? It is not the purpose of this paper to provide ways and means. It might be suggested, however, that the gentle art of sponging will take care of the visible pus and that what lurks behind had better stay where it is and be permitted to escape later than to be carried to parts we know not of.

PREVESICAL ABSCESS.*

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THE clinical interest of the space of Retzius exists in suppurative disease of that space. A condition first described by Wenzel Gruber in 1862, since then cases have from time to time been reported, appearing chiefly in the French and German literature.

In 1856 the Swedish anatomist Retzius presented to the Academy of Stockholm the first detailed description of this space, indicating at the same time the surgical importance of that region. As described by Retzius the space does not conform with the findings of more recent observers, and not until the publication of Leusser's studies in 1885 have the anatomical relations of this space been defined. Subsequent collaborators, chief among whom are Pinner, Panzat, Delbet and Waldeyer have in the main corroborated his findings.

The prevesical space is one peculiarly designed for its special function. Its contents are a mass of loosely reticulated connective tissue enclosing masses of soft fat, there are few blood vessels and some lymphatic glands. The boundaries of this space are in part fixed and in part flexible, which together with its soft contents, permits of the distensibility of the bladder. The surgical features of this region are dependent upon the arrangement of the fasciae contributing to its formation.

According to Waldeyer, the posterior rectus sheath terminates several inches above the symphysis, forming the semilunar fold of Douglas. Beneath this level the recti muscles on either side are covered posteriorly only by transversalis fascia.

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* Read before the Section on Genito-urinary Surgery of the New York Academy of Medicine, January 15, 1908.

The fibres of the recti muscles descend and are inserted on the anterior surface of the symphysis pubis, and the transversalis fascia descends to its insertion on the posterior surface of the same bone. It becomes evident therefore that a space results three cornered in its saggital section and whose base is equal to the antero-posterior thickness of the os pubis. This space contains loosely woven connective tissue and fat and lodges the deep epigastric artery. This is called by Waldeyer, the prefascial space.

Immediately behind this is a space of greater dimension and representing the true space of Retzius or Cavum Retzii, lying truly speaking retro-mural and prevesical.

Anteriorly is the symphysis pubis and transversalis fascia forming the posterior boundary of the prefascial space.

Posteriorly is a layer of fascia continuous with that covering the floor of the pelvis and stretching over the anterior and lateral walls of the bladder. Usually this space reaches up only to the fold of Douglas but occasionally to the umbilicus.

In its lower part the space is permanently prevesical, lying in front of the bladder even in its collapsed state and behind the symphysis. The lateral limits of this space are bounded on either side by a fold descending from the extremity of the fold of Douglas, these on either side descending as pillars to the symphysis pubis, form portions of the ligaments of Hesselbach. The lowest limits of this space are formed by the reflection of visceral and parietal fasciae upon the floor of the pelvis and immediately overlying the bladder neck, the prostate gland and sometimes part of the posterior urethra. It is of interest to note that both of these spaces are divided by a thin and imperfect median septum.

For the sake of completeness it becomes necessary to mention at this juncture, what has been described as a third space. This is called the preperitoneal space. It contains a thin layer of connective tissue, and lies for the most part on a plane above the bladder. Behind is the peritoneum and in front is a fibrous fasciculus, a continuation of vesical fascia.

Truly speaking this is not a space nor is it of any surgical moment.

The present anatomical conception therefore shows a marked deviation from the original one of Retzius, describing

FIG. 1.

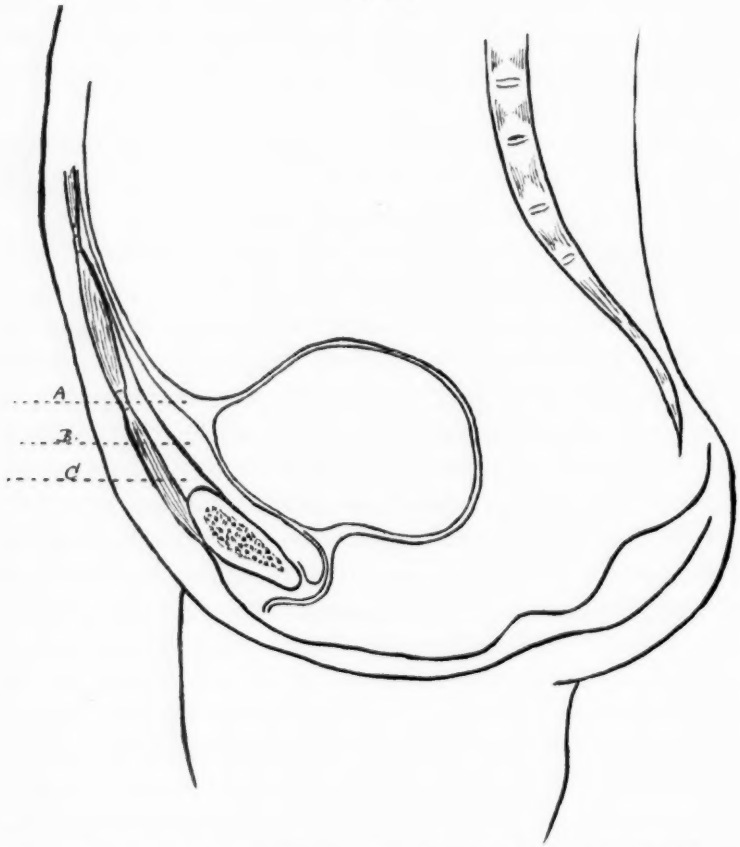

Diagram showing the three spaces constituting the space of Retzius. A, Preperitoneal; B, Prevesical; C. Prefascial.

three spaces instead of one, namely: 1. Prefascial or retromuscular space. 2. Prevesical space. 3. Preperitoneal space.

This description is not merely academic but finds its practical application both in an intelligent interpretation of the etiology of infections of this region and in their treatment.

Besides fat the prevesical space contains a few lymph glands which have been called anterior vesical lymph glands. These glands were shown by Gerota to drain in part the mucous membrane of the bladder, Cunéo et Marcille having reached similar conclusions. Küttner by a series of injection experiments showed these anterior vesical glands to communicate with the mucous membrane of the posterior urethra.

Twice Bavy found the anterior vesical glands enlarged at operation, one operation having been performed for vesical calculus and cystitis, the other for malignant tumor of the bladder.

The obscure etiology of prevesical infection has led many observers to overlook the initial causes and to consider many of the cases to be idiopathic in origin. Bouilly considers this a large class as does also Martin, Duplay et Reclus, Le Dentu and Delbet. It seems probable however that prevesical suppuration is rarely if ever idiopathic. Steinthal believes the class to be small and Leibold, Michels, Hassler and Honsell deny the occurrence of idiopathic abscess in the Cavum Retzii. A strikingly contrary standpoint to that maintained by Englisch, who believed these abscesses to be a disease sui generis and due to a peculiar agent having a selective action upon the prevesical connective tissue.

Honsell agrees with Leibold, who maintains that primary abscess in the prevesical space, is in reality broken down hematoma resulting from traumatic causes. Going a step further he states that such hematomata occur in the prefascial space or as he prefers to call it the retro-muscular space, and therefore not truly in the prevesical space at all.

The question of etiology has been discussed by Bouilly, Guyon, Leusser, English and others. Honsell in his very excellent article adopts the classification of Englisch, who divides these infections into four groups, namely: 1. Idiopathic. 2. Traumatic. 3. Metastatic. 4. Secondary. From the foregoing it becomes evident that the groups idiopathic and traumatic fall under the same caption. In fact it would

seem that for all purposes a division into two classes, primary and secondary is all sufficient.

The cases hitherto reported as metastatic all have been post-typhoidal. Honsell believes that inasmuch as typhoidal abscess shows a proclivity to the long muscles of the abdominal wall, such abscesses in great likelihood would occur in the prefascial and not in the prevesical space. If then we chose to be accurate in our terminology both the class names idiopathic and metastatic would fall away. A terminology however which would debar from this classification all abscesses occurring in the prefascial space would serve no good purpose and lead only to confusion.

In this connection must be mentioned Guyon's reported cases of " Hygrome de la Bourse Sereuse Prévesical," wherein serous fluid was found in the prevesical space. He suggests the existence of a bursa in this region and of its primary infection as a cause for prevesical abscess.

The large class of cases of infection of the prevesical space from traumatic causes distinguishes a class of its own, which demand recognition in this connection only in order to exclude them from the type of case under discussion. To this class belong all those cases resulting from infections of the prevesical space from external or internal injury, directly or indirectly applied.

Such cases are those resulting from gunshot or stab wounds with or without penetration of the bladder, or fracture of the pelvis. All those cases of traumatic rupture of the bladder or urethra with urinary infiltration, or injury to the bladder or urethra following instrumentation such as lithotripsy or catheterization or infection following supra-pubic section or puncture.

Eliminating therefore those of traumatic origin, a study of the reported cases of prevesical abscess reveals the fact that by far the great majority of cases bear a distinct relation to foregoing inflammation, and must therefor be considered as secondary.

The most prolific cause of suppuration in the prevesical

space is inflammatory conditions of the urethra, prostate and bladder. The primary inflammation may be acute but more often is of an indolent type and likely to be overlooked. Other causes are inflammation of the abdominal wall or sub-peritoneal tissues, suppuration in the pelvic or inguinal lymphatic glands, and osteomyelitis of the os pubis. In the female infection may emanate from diseased internal genital organs, and in children more especially from the intestines.

The following case I am permitted to report through the kindness of Dr. Herman Goldenberg, chief of the Genito-urinary Department of Mount Sinai Hospital. The case is of value because it deserves mention among the list of cases to be mentioned, and furthermore because certain clinical features have been studied which have been neglected in other cases, and which seem to throw much light upon the diagnosis which usually is obscure.

S. C., male aged 20 years, has had the usual diseases of childhood, has neither cardiac, pulmonary nor nephritic disease. He denies syphilis and gonorrhœa, and is habitually constipated. Present illness began suddenly eight days before admission to the hospital with pain referred chiefly to the rectum and a feeling of soreness in the pelvis which could not be defined. The pain became aggravated in the sitting posture. There was no frequency of urination but some burning and difficulty in starting that act. Two days after the onset of these symptoms the patient had to be catheterized for retention of urine, which after two more days again had to be performed. Since that time the patient has been passing urine at frequent intervals with burning pain, and has had some chilly sensations.

At the time of admission the patient presented normally developed genitals, no urethritis nor evidences of any previous attack. The urine was normal. Rectal examination revealed a prostate somewhat enlarged for a youth of his years, and on the right side was a small area distinctly more tender than the rest of the gland. Cystoscopic examination showed the trigone somewhat injected and " in the interval between the ureteral orifices were several small ulcers to which some mucus shreds were adherent."

The patient was treated by means of instillations of 2 per cent. nitrate of silver. He remained ten days in the hospital, during this time the temperature and pulse were normal, the burning sensation on micturition disappeared, and considering himself cured asked for his discharge.

Eleven days afterward the patient returned to the hospital with the statement that he remained entirely free from any disturbance for seven days, he then began to have pain in the hypogastrium difficult to localize accurately. At about this time a hard and rather globular mass appeared in the median line and just above the symphysis. During this time there had been little or no constitutional disturbance. Urination was normal, the urine containing neither blood nor pus. In the hypogastrium and just above the symphysis in the median aspect is a tumor resembling much in outline an enormously distended bladder. This tumor extends to about one and a half inches below the umbilicus and to about two inches to either side of the median line. It is hard, very slightly tender and flat upon percussion. The tumor does not vanish upon catheterization, and when examined bimanually the mass is recognized to be anterior to the bladder. The prostate gland is smaller than when the patient was first seen and is no longer tender. There is a moderate leucocytosis, a differential leucocyte count was not made. The temperature fluctuated daily from 99 to 101.4 and the pulse proportionately.

The cystoscopic examination revealed a most intense œdema bullosum of the entire anterior wall of the bladder with numerous submucous hemorrhages. The trigone was slightly injected, the rest of the bladder was normal.

The patient was treated with Kemps rectal irrigations and later poultices to the hypogastrium. In the course of the following few days, the character of the mass changed somewhat. Its outlines became more diffused and there seemed to be a sense of deep fluctuation. Five days after his second admission the patient was operated upon. A median incision was made over the tumor. Upon a plane just posterior to the recti and corresponding to the prefascial space was encountered a dense firm fibrous structure three quarters of an inch in thickness, giving much the impression of new growth. This extended laterally for some distance and represented inflammatory induration of the transversalis fascia. Only after extending the incision

through this thickened structure was the abscess cavity reached. The abscess was distinctly in the prevesical space and bore no direct communication to any other focus of infection. Bacterial examination showed the presence of staphylococcus aureus. The patient's recovery was uneventful.

I am led to believe that infection in this case emanated from an infectious nidus in the prostate excited by the catheterization and carried by the lymphatics to the anterior vesical lymph glands, which in their turn went on to suppuration and abscess formation.

In conjunction with the foregoing, a review of the cases from the literature is of interest. The cases divide themselves into the following etiological groups: 1. Infection from the urethra and prostate. 2. Direct infection by perforation of the anterior bladder wall. 3. Infection from adenitis in the vicinity. 4. Infection from the female genital organs. 5. Infection from osteomyelitis of the os pubis. 6. Infection from the intestinal tract. 7. Infection emanating directly from the vermiform appendix.

GROUP 1.—*Infection from the urethra and prostate*—as mentioned above this is probably the most prolific cause, and occurring as in the case cited.

CASE 1.—MEIGNANT reports two cases both probably of urethral origin. The second case exemplifies well a condition encountered in several of the cases, namely, "abscess en bisac," or hour glass abscess. The primary abscess occurring in the prevesical space perforates the transversalis fascia and infects the prefascial space. The surgeon encountering this condition is likely to drain only the abscess in the prefascial space, overlooking the more serious condition underlying.

CASE 2.—PARA ET TUFFIER, female, uterus and adnexa normal, point of origin of infection, urethritis and cystitis. The entire lower segment of the abdominal wall from the symphysis to the umbilicus presented a painful board-like intumescence. The condition found was abscess in the prevesical space with intense inflammatory involvement and thickening of fascial structures of the abdominal wall.

CASE 3.—COSTANEDA Y CAMPOS reports case similar to the above, which is, however, of special interest because it ruptured spontaneously.

CASE 4.—HASSLER—Bottini operation performed two years previously. Large hypogastric tumor developed in course of several weeks, which proved to be prevesical abscess. Staphylococcus aureus was found.

CASE 5.—HOTCHKISS—Old stricture of the urethra and vesical calculus. Transversalis fascia, board-like in character and half inch in thickness. Marked inflammatory reaction, with little or no abscess.

GROUP 2. *Cases following perforation of the anterior bladder wall.*—This group of cases is secondary to aggravated cystitis whether that be due to the irritation of calculus or to tuberculosis, and would include cases of direct penetration of infection without apparent perforation. We have seen from the experiments of Gerota the relation of the bladder mucosa to the anterior vesical lymphatics.

CASE 1.—DUPLAY—Old prostatic with ulcerative cystitis, developed painful tumor in hypogastrium. Autopsy showed perforated ulcer of bladder and infection of prevesical space.

CASE 2.—CRISTOL reports case similar to the preceding.

CASE 3.—LEIBOLD—Female, tubercular nephritis and cystitis. Perforating ulcer of anterior of the bladder.

CASE 4.—HEWETT—Female, 9 years, tubercular cystitis, perforating ulcer infecting prevesical space. Spontaneous rupture. Died.

CASE 5.—LAUWERS—Male, 19 years, spontaneous rupture of the anterior abdominal wall. Resulting urinary fistula, calculus removed. Recovery.

GROUP 3. *Infection from adenitis in the vicinity.*

CASE 1.—HONSELL—Man, for years having suffered from various tubercular lesions. Suppurating inguinal glands burrowed behind symphysis and infected prevesical space. Hypogastric tumor developed slowly. Abscess cavity found to contain tubercular granulation tissue.

GROUP 4. *Infection from the female genital organs.*

CASE 1.—MICHELS (third case of series).—Although not positively stated, the infection of the prevesical space probably emanates from a ruptured tubal pregnancy.

GROUP 5. *Infection following osteomyelitis of the os pubis.*—The location of an abscess resulting from osteomyelitis of the os pubis, is determined by the place where the exudate pierces the periosteum. If the periosteum is ruptured in the upper part of the bone, infection will occur in the prefascial or retro-muscular space. If perforation occur in front it will present under the skin, or if below, the planes of least resistance will cause abscess to appear in the scrotum or the labium majus, or in the peri-rectal tissues. If, however, perforation occur upon the posterior surface of the os pubis it

must inevitably lead to infection of the prevesical space. Perforation at this point is least frequent owing to the fact that here the periosteum is re-enforced by the transversalis fascia.

CASE 1.—GRUBER—At autopsy the prevesical space was found the seat of abscess. The prostate gland was normal, but at either side was a channel of communication between the prevesical and ischio-rectal abscesses. On the left side the os pubis for some distance was denuded of its periosteum and the bone was eroded. Whereas the prevesical infection may have emanated from a peri-rectal abscess, I rather believe the infection to have been primary in the os pubis.

CASE 2.—GRENSER—Female, pregnant. Trauma to os pubis followed by fever and later developed hypogastric tumor. Autopsy showed abscess in the prevesical space communicating with large area of caries of pubic bone.

CASE 3.—KIRCHNER—Case of sudden onset in young man 21 years. Symptoms of fever delirium and pain and later the development of a tumor in the hypogastrium. Incision opened an abscess in the prefascial space which led to the os pubis denuded of its periosteum. The symphysis was infected and an epiphysis lay free in the cavity. The sequestrum was removed and recovery ensued.

GROUP 6. *Infection emanating from the intestinal tract.*

CASE 1.—MARTIN—Infant, 16 months old. Etiology is obscure though probably of intestinal origin. Prevesical abscess drained and recovery followed.

CASE 2.—MICHELS (second case of series)—Carcinoma of the intestine ulcerating and infecting the prevesical space.

CASE 3.—GUYON—Case similar to the preceding.

GROUP 7. *Cases following direct infection from the vermiform appendix.*

These cases would not be out of place in Group 6, but perhaps they deserve a special grouping.

CASE 1.—BRUN—Boy, 9½ years. Was sick for 14 days with symptoms of acute appendicitis. Gradually there developed a painful tumor in the hypogastrium. The urine having been clear suddenly contained foul pus. Autopsy showed an abscess in the prevesical space. The posterior wall of the abscess cavity was formed by the anterior bladder wall and peritoneum. The appendix lost itself in adhesions in the posterior wall of the abscess cavity, its lumen communicating directly with same. A second perforation opened freely into the peritoneal cavity.

CASE 2.—TUFFIER cites a similar case which however recovered after draining the abscess cavity; a fecal fistula persisted, until an intra-

abdominal operation was undertaken. The appendix was found to be the cause. Recovery followed.

Leusser, Englisch, Bouilly, Guyon and Gerardin have attempted to delineate the clinical sequence of this disease, dividing the symptoms into stages. It is apparent that no such periods can occur in a condition dependable upon so many different causes. Nor does any one clinical picture portray its many manifestations.

Bouilly, Leusser and Englisch divide the symptoms into two groups: first, prodromal; second, tumor formation. Honsell correctly says, no periods exist, some cases begin with tumors and in others death may supervene before that event. Although most of the cases have occurred in adult life neither infancy nor childhood precludes that condition, one case having occurred at the age of 16 months, and another at 9 years. The condition is more frequent in the male but a fair proportion of the cases have occurred in the female.

In consequence of the fact that infection of the prevesical space is practically always, except in traumatic cases, secondarily invaded, there must precede a group of symptoms referable to that primary lesion. Without entering upon the symptoms of that primary group, whether that be symptoms of cystitis, osteomyelitis or appendicitis, there comes a moment when the prevesical space becomes invaded and from that time on there is a similarity of symptoms. Pain is a prominent symptom, it is not necessarily severe. It is difficult to locate in the milder cases and gives the sensation of pressure or weight in the pelvis. There is some tenderness which becomes marked only with the appearance of the tumor. The patient stoops forward in walking or standing in order to prevent contraction of the abdominal muscles. The tumor may appear early, but in most of the reported cases appeared late. The formation of a tumor in this region rather than a diffuse phlegmon is due to the distribution of dense fasciae preventing the dissemination of inflammatory materials, and as a result of that an enormous thickening of the fibrous

walls of this space. The tumor is usually in the median line, but may be somewhat to one or the other side.

In outline when seen early it is globular and appears above the brim of the pelvis, later its lines become more diffused and at a still later period may no longer be globular, but gives the impression of a board-like hardness to the lower part of the abdominal wall. Fluctuation if it occurs at all appears late and only after the abscess has perforated into the prefascial space, producing an abscess " en bisac " or hour glass abscess. There may be no urinary symptoms unless the bladder becomes secondarily involved. Constitutional symptoms are variable but are usually mild.

The bacteriology of prevesical abscess has not been satisfactorily investigated. In my case the organism was staphylococcus aureus, this organism was found also in one other case in which the bacteriology was studied. In Honsell's case tubercle was found.

The very significant cystoscopic finding in the case described above has led me to believe that this may be an accompaniment of all cases of prevesical suppuration, and therefore a valuable sign in the diagnosis of that condition. I refer not only to the œdema bullosum but also to its limited distribution to the anterior bladder wall.

A remarkable issue of these prevesical inflammatory tumors is their spontaneous resolution. This has frequently been observed. Merkel reports one case in a series of 5, and Cotte, quoting Villiers, mentions this occurrence five times in a series collected by him of 53 cases. Resolution is accompanied by subsidence of fever pain and the gradual disappearance of the tumor. The usual termination, however, is by suppuration which if not relieved by incision ruptures spontaneously. A most unfortunate termination is by perforation into the peritoneal cavity, an event which has been observed 10 times. Spontaneous rupture externally usually occurs in the median line and occasionally by multiple perforation. Rupture into the bladder and rectum has also been observed.

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SYMPTOMLESS HEMATURIA.*

REPORT OF THREE CASES IN WHICH HEMORRHAGE CEASED AFTER CATHETERIZATION OF THE URETERS.

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IN reporting these cases I do not pretend to claim that ureteral catheterization has cured them, and only state the facts in each case. It is rather interesting to note that immediately following ureteral catheterization blood disappeared in these 3 cases, and up to the present time has not returned.

CASE I.—Male, 45, carpenter. He was first seen by me in November, 1905. His previous history was negative, no history of any trauma. Six months before I saw him he noticed blood in the urine that has continued unintermittingly. No frequency, pains or symptoms of any urinary irritation. There was a slight loss of weight but he did not appear anaemic. The urine passed was very bloody. Sp. Gr. 1020, acid reaction and a trace of albumin—the microscopical examination was negative except for blood and a few leucocytes.

Cystoscopic examination November 10, 1905. Bladder capacity, 300 c.c. Mucous membrane of bladder normal, blood seen flowing from the right ureter. Both ureters were catheterized, ureteral catheters passing to the kidney pelvis without obstruction. The urine collected from the right ureter showed blood and a few leucocytes, otherwise normal, that from the left ureter was perfectly normal. There were no more white cells present than could be accounted for by the amount of blood seen. Examination of urine 24 hours after ureteral catheterization showed clear urine apparently free from blood, but on microscopical examination a few red cells were noted. Forty-eight

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hours after ureteral catheterization the urine was clear and no blood cells could be found on microscopical examination. The blood has never recurred in the urine up to the present time, 20 months after ureteral catheterization.

CASE II.—This case was referred to me by Dr. Mason. Male, 53. Past history negative. One and a half months before I saw the patient his wife noticed that he was passing bloody urine, three days before this symptom was noted the patient was working on a roof supported by a rope tied around his waist. At the time I saw him he had never had any symptoms other than the blood in the urine. When examined I found him to be a well preserved man, slightly anaemic. On passing his urine it was noted that it contained a large amount of blood. The blood had continued without cessation for a month and a half. Cystoscopic examination revealed a normal bladder mucosa and showed bloody urine escaping from the right ureter. Catheterization of the two ureters showed bloody urine from the right side that contained no abnormal elements except the red blood cells; while that from the left side was perfectly normal. An examination of the mixed urines was negative except for the blood. The day following the ureteral catheterization the urine was perfectly free from blood. It is now three and one half years afterwards. There has never been any recurrence of blood in the urine and in all this time the patient has been in good health.

CASE III.—R.M., 56 years of age, bank cashier from Virginia. This patient was first seen by me in October, 1906. Previous history, pneumonia at 21, sick two months, recovered; no venereal diseases. During the same year that he had pneumonia his urine became bloody. At times the blood would almost disappear, but exposure, indigestion or exercise would cause a recurrence. There was no pain when bleeding would occur except when clots would be present in the urine. This was 35 years before he was seen by me. As a young man he consulted a number of prominent surgeons among the number being Dr. Nathan R. Smith of Baltimore, Dr. Hunter McGuire and others. He was advised against any operative procedure.

During the last 15 or 20 years the blood has been much greater in amount and much more constantly greater than during the early years of his illness. He has never had any pain in

the bladder or symptoms of vesical irritation. He has never complained of any symptoms other than that of blood in the urine for 35 years except he has had what he describes as attacks of lumbago. From what he says there is possibly some relation between the passage of clots and these attacks of lumbago which he describes. He says that the blood is always seen to be intimately mixed with the urine, but at times is more abundant in the last urine passed. The patient is an educated man and one I believe whose statements can be relied upon. He assured me that his urine had never been free from blood for 35 years and his present physician said it had been so to his personal knowledge for 17 years. At times the urine would be vermilion color, at other times it would vary between a port wine and almost inky blackness.

On examination it was seen that the patient was anaemic, emaciated and had the appearance of being a very ill man. On palpation of the kidneys no tumor could be felt and deep pressure elicited no more pain on one side than on the other. The other genito-urinary organs appeared normal. The urine passed by the patient was very bloody being the color of port wine and the last urine passed contained some small clots. Examination both chemically and microscopically of the urine was absolutely negative except for blood.

Cystoscopic examination on October 25, 1906, showed a normal bladder and very bloody urine escaping from the right ureter, both ureters were catheterized both catheters appearing to pass to the pelvis of the kidney without obstruction. Clear normal urine escaped from the left side while very bloody port wine colored urine escaped from the right side. Microscopical examination of the left urine was perfectly normal that from the right showed very numerous red cells and a few leucocytes. When I visited the patient at the Garfield Hospital 24 hours after ureteral catheterization he informed me that the bleeding had stopped. On examination the urine seemed to be clear and microscopical examination showed only a few red blood cells. I insisted on his having an X-ray picture taken, but he wished to go home first. As the bleeding has not recurred he has neglected to return to Washington. I have been in constant communica-

tion with him for the past twelve months. He has informed me that his health is better than it has been in years, he has gained weight, strength, and has no recurrence of the hemorrhage whatsoever.

NOTE.—Since this article went to press I have examined the patient referred to as Case 3. He has gained 26 pounds and appears in perfect health. He has had frequent microscopical examinations of his urine and at no time has any blood been noted. It is now 17 months since his ureters were catheterized.

CYSTIC DEGENERATION OF THE KIDNEY.

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CASE.—Mrs. H. M. J., age 46, married, referred to me by Dr. W. C. Lewis, was admitted to the Rebekah Hospital August 13, 1906. During the five years previous she had complained of difficulty in breathing which at times was very severe, the attack would last from one half to four hours. Whiskey and other home remedies were made use of and on some occasions artificial respiration was resorted to. She occasionally complained of nausea, but never vomited. Five months ago she noticed an enlargement in the left lumbar region which rapidly increased in size.

Examination.—Urine from left kidney highly colored, specific gravity 1028, sediment, normal, blood, slight in amount, casts, both hyaline and granular. Urine from right kidney normal. A mass extending from the symphysis pubis upward to the left, behind the lower ribs, could be made out; approximately six or seven inches in diameter and twenty-one inches in length. There was some tenderness.

Operation.—A median incision showed the opposite kidney was not enlarged. A right lumbar incision exposed a multilocular cystic kidney; the visible cysts varying in size from a split pea to an orange. The size of the mass precluded the possibility of delivery through the incision in the loin until after thirty or forty cysts had been punctured. The vessels and ureter were separately ligated, the remaining mass removed and the cavity packed with sterile gauze. Convalescence was uneventful, the patient leaving the hospital six weeks later; after eighteen months she remains entirely well.

Under the name Cystic Degeneration, has been described a peculiar lesion manifested by the presence of multilocular cysts, occupying the area of and replacing the kidney. Frequently cystic kidneys contain no discernable renal tissue; in

other instances only part of the kidney is involved. The disease often exists for years; no diagnosis being made owing to entire absence of symptoms, while not infrequently sudden death takes place from uremia or cerebral hemorrhage due to kidney insufficiency.

Cystic kidney in the new-born has long been recognized. Fussell collected eleven cases in which it was necessary to mutilate the fetus in order to accomplish delivery. The tumors in the adult may be of enormous bulk weighing (as in Hare's case) as much as twenty-four pounds. These tumors are usually bilateral and may increase in size under observation.

Hematuria, sclerosis of arteries, hypertrophy of heart with accentuated second sound, and albuminous urine are among the more common symptoms. Cystic kidney occasionally, as in the case here reported occupies a large portion of the abdominal cavity. It is made up of numerous cysts varying in size from a pin head to a cocoanut and little or no recognizable renal tissue may be found. The fluid within the cysts is clear, slightly albuminous, presenting cholesterin, blood pigment and detritus resulting from degenerative and necrotic processes in the epithelium of the cystic wall. In some instances the connective tissue of the cyst is not covered by a recognizable amount of epithelium, in other instances epithelium, when found, varies in amount, both granular and necrotic; and in still other specimens columnar epithelial cells from the inner layer of the cyst wall are found. The matrix between the epithelial cell may be fibrous or myxomatous and is not infrequently extremely vascular.

Our lack of knowledge of the etiology of these cysts has given rise to much discussion. The earliest theory, that of Virchow, was that they were due to an obstruction of the tubules. Later he expressed a belief that cystic kidney was due to an intra-uterine papillitis, this view was reaffirmed by him in 1892.

Arnold, regarded the process as beginning in the pelvis of the kidney and speaks of the lesion as an "ascending pyelopapillitis fibrosa." The inflammatory origin of cystic

kidney, founded on the great increase of connective tissue in the pyramids and the numerous foci of round-celled proliferation present has been supported by Thorne.

Brigidi and Severi, in 1880, basing their opinion upon epithelial sprouts into the surrounding connective tissue from the walls of the tubules, especially of the straight tubules, also an increase in the layers of the tubules and proliferations of epithelium in continuity, so that the epithelium appears contorted within the lumen, claimed that cystic kidney bore marks of a tumor and called it multilocular adenocystoma, this point of view though confirmed by Chotinsky, Nauwerck, Hufschmidt, Janowski, Kalilden, Hain and Alber was declared by Marchand to be untenable. Durlach believes it due to a proliferation between the lobules of the kidney, that is, of tubules between the pyramids and their outlying cortex. Leichtenstein thinks it begins as an inflammation or inflammatory irritation in the arteriolæ rectæ, which are small vessels between straight tubules and give striations to pyramids.

Shaddock concludes that the condition depends on the mal-development of mesonephron or the Wolffian body fused with the metanephron and that the cysts result from the evolutionary changes in the included mesonephron. Van Mutach recognized from a microscopic point of view striking embryonal characteristics of cystic kidney.

Hildebrant explained the condition on purely embryological grounds. Deetmar, Schenkl and Rukert accept cystic kidney simply as a form of mal-development of the organ.

Milward divides the clinical history of the disease into three stages:

1. The stage of progressive enlargement of one or both kidneys without subjective symptoms. The renal enlargement is discovered, if at all, by accident. This stage may last from a few months to several years.

2. The stage of subjective symptoms and objective signs. This stage lasts from a few months to seven or eight years, or even longer. The signs and symptoms are dependent on the size and weight of the tumors.

3. The stage of decreasing elimination of urine. In this stage appear the symptoms of uremia, or cerebral complications. This disease which affects males and females in about equal proportion usually terminates fatally about the age of forty-five. The symptoms of the second stage are dull, aching pain in the region of the kidney. Flatulence, headache, dyspepsia, vomiting, anorexia and constipation are frequently met with. Examination of the urine may throw very little light on the diagnosis, though the specific gravity is usually low and the amount passed is generally slightly increased. A trace of albumen is usually found, but is never present in large quantity in the second stage except when there is a large amount of blood. Leucocytes may be met with in large numbers and pus is often present. Blood is usually present and may occur at intervals of weeks, months or years or may never be noticeable by macroscopical examination of the urine, though according to Milward it is always present and is significant. The symptoms of the third stage are those of uremia.

The treatment for congenital cystic kidney consists of removal of the organ, unless the other kidney is diseased which can only be positively determined by exploratory incision. While Schmidt, Neimeyer, Bardeleben, Hayems and others have performed nephrectomy for polycystic kidneys, the patients having died of uremia, the opposite kidney has in all cases been found to be the seat of rather extensive disease. Where the opposite kidney is involved an incision through the loin, puncturing the cysts and stitching the kidney to the lumbar muscles is the procedure indicated.

Pathological Examination of the Specimen Removed in the Case Reported.—Gross. The kidney after evacuation of the larger cysts weighed 1,400 gms. It is 24 cm. in length and 15 cm. in width, and the shape is almost rectangular. The anterior surface is studded with small cysts varying in size from almost microscopical points to the size of a walnut. (Fig. 1.) They bulge outward prominently, giving the kidney the appearance of a bunch of grapes. The superficial cysts have very thin walls and are transparent. They are light yellow to brownish-yellow in color. The posterior surface is similar to the anterior; however, the cysts are not so prominent. The pelvis of the kidney is narrow and extends deep between

the upper and lower overhanging projections of cyst masses. The vessels entering are large, but not thickened. The ureter is not dilated.

In making the incision for the cut surface, the organ is laid open in its longest diameter, the incision being made from the convex surface toward what constitutes the pelvis. This cut passes thirty-three cysts, each larger than a pea. (Fig. 2.) The cut surface of the kidney shows little kidney tissue recognizable as such. No striations can be seen. The surface has a honeycombed appearance. The color of the kidney substance is grayish. The largest cyst is at the upper, inner pole, and has a diameter of 7½ cm. It is deep, round, and lined with a smooth surface, and crossed by falciform trabeculae in part. It has five depressions, about 1½ cm. in diameter, which have the appearance as if five small cysts had coalesced and formed the large one. Shining through the wall of the lower inner depression are seen two black cysts. The contents of the cysts are in part clear serous fluid; others contain a jelly-like colloid material. Some contain a purulent material, and others a black hemorrhagic fluid, or are clouded with a brown substance. Numerous smaller cysts are seen on the cut surface of the kidney. They are mostly round and form hollow spaces. Their septa and walls show traces of kidney parenchyma. The cyst contents is alkaline in reaction and contains albumin. Microscopically it shows red blood cells and leucocytes with granular degeneration. Fat is shown to be present by Sudan III stain. The calyces are only rudimentary and are distorted by compression of the cysts. Their lining is smooth and pink in color. The walls are thicker than normal. There is considerable pelvic fat.

Microscopic: *Section* 1.—Showing one of the smallest cysts. The cyst content is not stained. The cyst is lined by tubular epithelium which is slightly flattened. The protoplasm of the cells is granular and not stained as deeply as normal. The nuclei show a vesicular condition. They are nearly all large and contain less chromatin than do the nuclei of normal tubular epithelium. The connective tissue surrounding the cyst is increased, and is rich in nuclei. The tubuli contorti are increased in number and apparently widened. Their lining epithelium is wider than that lining the cyst and takes a deeper stain. (Figs. 3 and 4.) The glomeruli do not differ from those of a normal kidney. They are normal in number and size. Their capsule is not thickened.

Section 2.—Showing wall of a microscopic cyst smaller than a pea. (Fig. 5.) The content is not stained. The lining epithelium is much flattened and faintly stained. In places it is detached or absent. The connective tissue shows greater increase in nuclei than in previous section and replaces tubules to some extent. The picture is similar to that of a chronic interstitial nephritis. There is marked infiltration of lymphocytes. The tubules are elongated and flattened so that their lumina are filled. The glomeruli are distorted and deformed by pressure and the capsule of Bowman is thickened. Some glomerular tufts show vacuolization. It is probably a hydropic degeneration, however; no fat is seen by staining with Scharlach. The blood vessels are thickened; chiefly the tunica

muscularis. The lumina are large and filled with blood in the region near cysts.

Section 3.—Showing wall of a hemorrhagic cyst the size of a pea. (Fig. 6.) The content consists of blood pigment, degenerated epithelial cells and detritus. The epithelial lining of the cyst is absent, so that only a connective tissue lining is seen, which is wide and shows irregular heaps of new-formed nuclei. There are no tubules present. Some glomeruli are present, but show a more advanced stage of degeneration than in the previously described sections. They are small with greatly thickened capsules. The tufts fill the capsule only in part. The blood vessels are greatly dilated.

CONCLUSIONS.

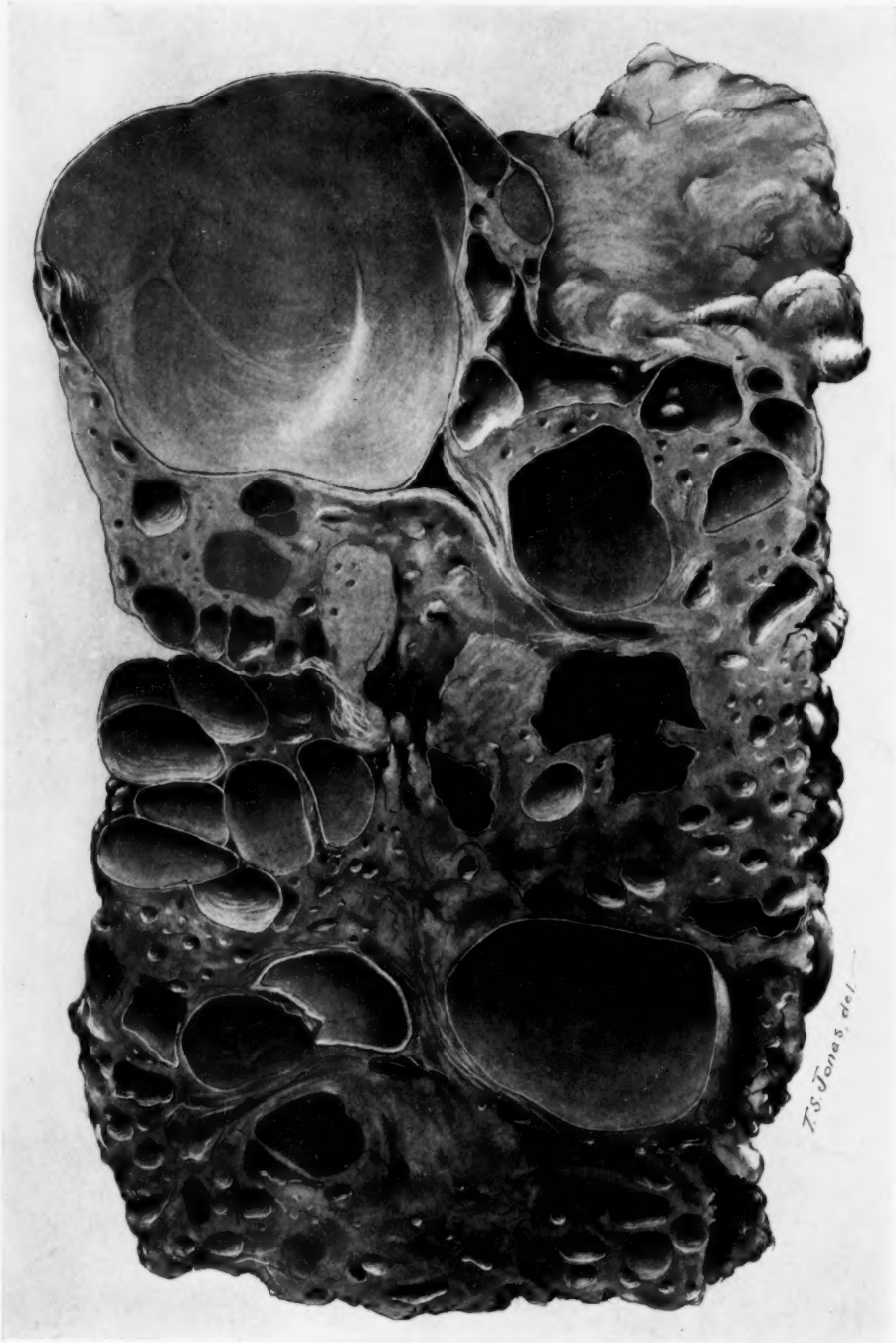
I. In the cells lining the cysts, the entire row are alike, and apparently in the same stage of secretion, that is, the nuclei are poor in chromatin and show a vesicular condition. In the normal convoluted tubules, this condition is present in a few cells only while very many are rich in chromatin and show filaments or striations known as "ergastoplasm." This condition of the normal convoluted tubules is met with in active secreting cells. While the condition of the cells lining the cyst would correspond to a stage in secreting activity, it is not probable, however, that the entire row lining the cyst would show the same stage in secretion because we have no proof that secretion occurs in cells simultaneously. Therefore in my opinion the cells lining the cysts are less active in secreting power than normal epithelium.

II. These various theories of the origin of cystic kidneys have been discussed previously in this article. From the study of the microscopical sections I find that the smallest cysts are lined with the same epithelium as that lining in the convoluted tubules. Therefore, one must conclude that the cysts originate in the convoluted tubules by dilatation and proliferation, lining epithelium. In this kidney I can say with certainty that the cysts do not arise in the glomeruli, the blood vessels or the connective tissue.

FIG. 1

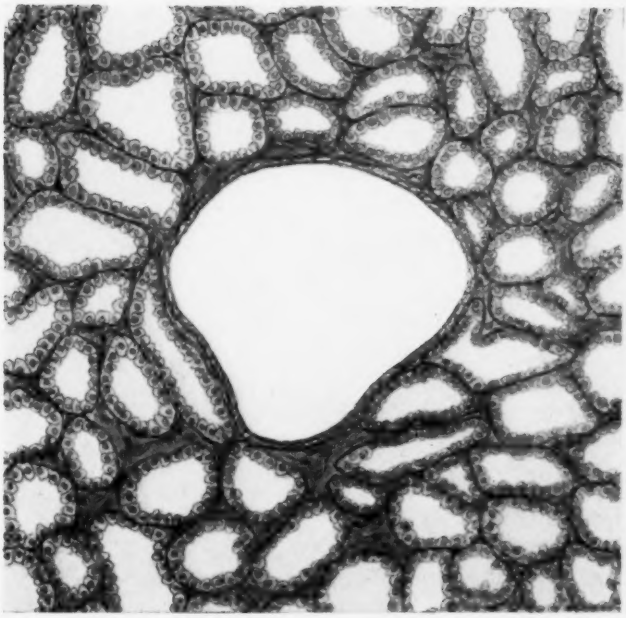
External surface of cystic kidney extending from the brim of the true pelvis to the angle of the scapula. Removed at operation from patient of Dr. E. K. Lewis. Recovery.

FIG. 2.



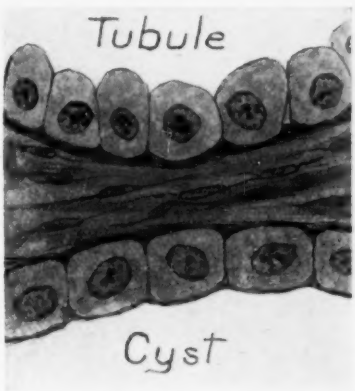
Transverse section of Fig. 1.

FIG. 3.



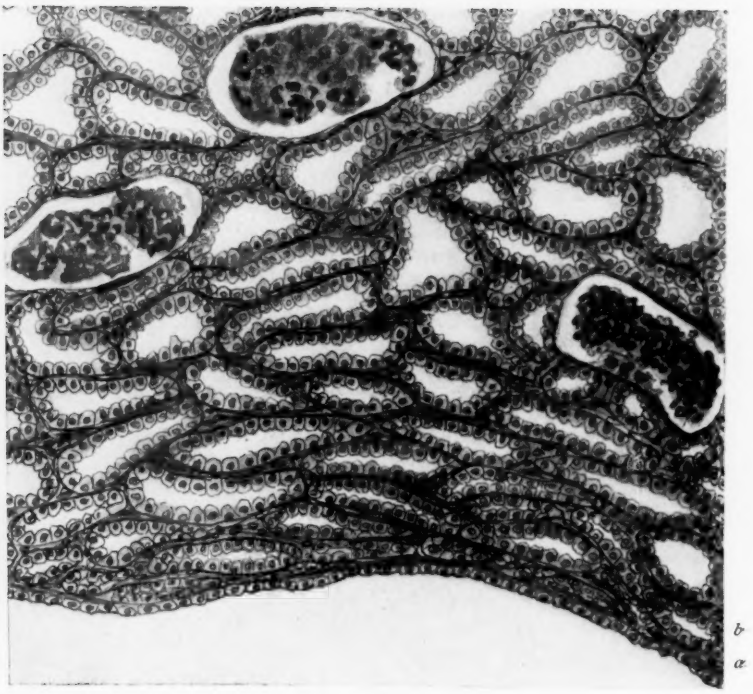
Microscopical appearance obj. 3 of one of the smallest cysts from section 1.

FIG. 4.



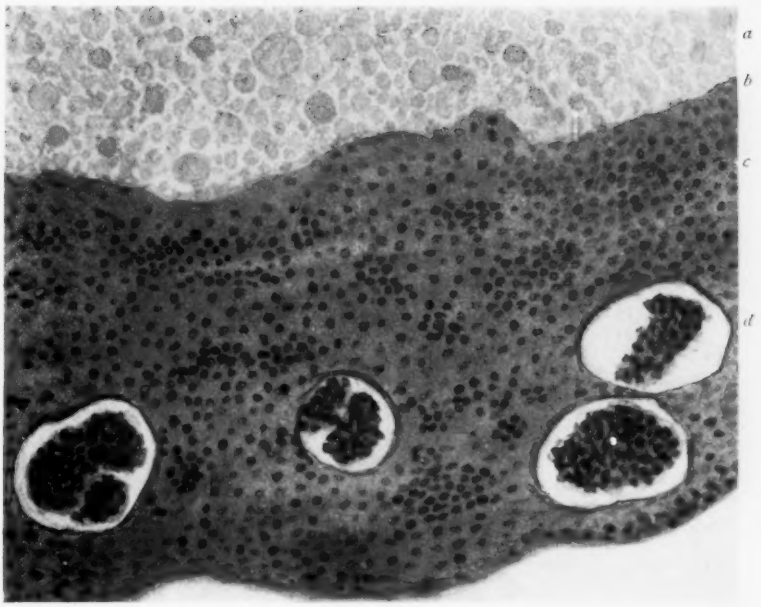
High power obj. $\frac{1}{12}$ showing lining of cyst and tubule, from section 1.

FIG. 5.



Microscopical appearance of wall of a cyst smaller than a pea, from section 2. *a*, cyst lining *b*, flattened tubules.

FIG. 6



Microscopical appearance of wall of a hemorrhagic cyst the size of a pea, from section 3. *a*, blood pigment. *b*, connective tissue lining. *c*, round cell infiltration. *d*, degenerated glomeruli. No convoluted tubules are seen.

VENOUS THROMBOSIS AND HYDROCELE OF THE INGUINAL CANAL.*

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CONSIDERING varicosities of the pampiniform plexus, the rarity of thrombosis in them is striking. In varicosities of the lower extremity and of the rectum clotting and inflammation are of frequent occurrence. In the rare instances in which I have seen a varicocele thus affected, the process has, for the most part, been limited to the distal radicals and always in close relationship to the testicles and the tunica vaginalis. In contra-distinction to these cases I beg to call attention to thrombosis of the spermatic vein occurring higher up and in the inguinal canal, and leaving intact the lower vein radicals.

The long course of the spermatic vein and the comparatively slight amount of blood, which in an auxiliary way flows from the testicle through the deferential vein, would seem to make it a favorable place for stagnation in the blood column and thrombosis. It would seem that by violent effort, by direct injuries or by pressure of a truss, thrombosis with its usual sequences would be of common observation. Either this is not the case, or the condition, if observed, may have seemed so trivial as not to have been deemed worthy of record. At least in my study of relevant literature I have found nothing bearing on the subject. Nevertheless in the last few years I have seen three distinct cases of thrombosis in the spermatic cord within the canal, each affecting an adult without varicocele. I beg to submit a brief history of the cases.

CASE I.—J. W. F., aged 43, married, and of excellent habits. Has no history of venereal disease or of hernia. After violent

* Read before the Southern Surgical and Gynecological Association, December, 1907.

exercise at tennis he suddenly experienced very sharp pain in the groin attended with nausea and slight vomiting. When seen twenty-four hours after the onset there was some acceleration of the pulse rate and the temperature had risen to 102. After the third day the temperature had entirely subsided and continued normal. The first examination showed a very marked tenderness in the upper part of the scrotum, and the presence of a firm cylindrical swelling, evidently of the cord, extended into the inguinal canal; but failing by more than an inch to reach the epididymis. At the lower end a bifurcation of the induration could easily be felt. As far as it could be palpated the cord presented the feel of a thrombosed vein. Forty-eight hours after the onset, there developed a tenderness and a slight swelling of the epididymis, although the enlargement of the cord did not extend downwards. There was no enlargement of the external ring, nor could any impulse on coughing be elicited. Under purely expectant treatment and rest in bed, the condition gradually subsided, and in about ten days the restitution to the normal was complete.

CASE II.—S. G., aged 52, married. Has had several attacks of gonorrhea, the last one twenty-eight years ago. Has never had a hernia. He ascribes his condition to excessive golfing, but is not aware of having injured himself by any single violent effort. He presented himself at the office because of a dull pain in the groin, which had continued without abatement for one week. The pain was not severe enough to keep him from his work. There were no constitutional symptoms at any time. Through the thin abdominal wall the intra-canalous portion of the cord could be readily palpated. It was very tender to the touch, distinctly indurated and nearly as large as the little finger. Traced downward the induration could be felt in the upper part of the scrotum and was gradually lost in the lower part of the cord. Neither the testicle nor the epididymis was involved at any time. As in the previous case, the condition disappeared slowly in a little over three weeks.

CASE III.—S. R., aged 49, widower. Has no history of venereal disease. He has had a reducible right inguinal hernia for many years, for which he has recently had a new truss fitted. To this he ascribes his present illness, which began with pain in the region of the hernia sufficiently severe to confine him to his bed. When first seen he had slight elevation of temperature

and some malaise consequent thereon. There was some little nausea, but no vomiting. The bowels moved readily on slight stimulation. An examination showed the abdominal wall over the canal very much relaxed as one sees it after the long wearing of a truss. The hernial opening was large enough to readily admit the finger. It was empty but very tender. On my second examination, twenty-four hours later, there could be felt within it a tender cord running into the scrotum and not quite reaching the epididymis. During the next few days the latter became somewhat tender and sore. There was at no time any effusion into the tunica vaginalis. Three weeks in bed with rest sufficed to cause the induration in the cord to gradually disappear. Although more than a year has passed since the attack and the patient has continued wearing the truss, there has been no recurrence.

In each of these cases I have recently examined the spermatic cord and found it normal. While we are led to believe, and in the majority of cases it doubtless is true, that thrombosis of a vein recovers with the formation of a fibrous cord which remains, in these cases it is probable that by a process of liquefaction and absorption of the thrombus an entire restitution even to the calibre of the veins took place. In none of the cases was there any justification for operation, wherefore the clinical diagnosis of thrombosis of the spermatic vein might be questioned. In each of them an infective process could be positively excluded, and except in the third case a hernia did not exist. The slight participation of the testicle and the epididymis in the process and its secondary nature preclude even the suspicion of an ordinary epididymitis. All of the cases were on the right side.

With the exclusion of the most common etiological cause of thrombosis, namely, bacterial invasion, we must look to some mechanical obstruction or trauma from very violent muscular action as to the cause of the thrombosis in these cases. Whereas it is well known that even prolonged compression of a vessel as of the carotid artery in prevention of hemorrhage in major operations about the head is not followed by thrombosis,

this condition is much more likely to arise in thin walled veins with their many small and irregular tributaries. It appears to me that the cases described are a mild type of the condition following torsion of the cord, to which attention has quite recently been directed. In torsion of the cord, however, the symptoms are exceedingly severe and associated with symptoms of abdominal shock. In 70 per cent. of the cases collected by Bochdaneck castration became imperative by reason of gangrene of the testicle. In the great majority of cases the diagnosis of torsion of the cord was not made, and the operations were for the most part performed under the belief that there existed a strangulated hernia.

Fortunately I have had two opportunities of verifying the diagnosis of thrombosis of the spermatic vein by operation.

Case IV.—J. C., aged 38, admitted to the Cincinnati Hospital, January 21, 1899. Has had a previous history of malaria. On January 9th while working on a flat car unloading timber, a jack-block struck him in the groin. He was knocked off the car, but did not lose consciousness at any time. With assistance he was enabled to walk to his home. Twenty-four hours after the injury was sustained, he noticed a swelling in the left groin and severe paroxysmal pains. The bowels moved regularly and there was no nausea nor vomiting at any time. He remained in bed for about two weeks, during which he states the swelling diminished and the pain in the groin abated somewhat.

Examination negative except for local condition. Over the abdomen there is a bluish-green discoloration of the skin near the anterior superior spinous process. This is evidently the result of a superficial ecchymosis. The left testicle hangs much lower than the right. In the cord for about two inches distinct irregular thickenings of the vein can be felt. The ring distinctly patulous admits the finger which comes in contact with a hard circumscribed swelling an inch or more long. It is of a diameter of the little finger and appears to have a distinct impulse on coughing. The cord feels like a thrombosed vein.

Operation January 23, 1899. General anesthesia. Incision over the external abdominal ring extending into the scrotum. Easy exposure of the thrombosed vein. The further steps of

the operation consisted of splitting the aponeurosis of the external abdominal oblique and thorough exposure of the contents of the inguinal canal. In this there was found an unoccupied narrow vaginal prolongation of the peritoneum and underneath it the cord with the vas deferens hidden from view by the thrombosed vein which extended quite into the internal ring. The thrombosed part of the vein, irregular in diameter and about two inches long, was resected. The operation was completed as an ordinary Bassini. The patient made an uninterrupted recovery and was discharged February 16, 1899.

This case was the nearest approach I have seen to a hernia resulting from a direct injury. The presence of a partly open peritoneal process directs attention to the possibility of an effusion into it as a result of the thrombosis, if the later had not been relieved by operation. When this process does not exist, a hydrocele within the canal can probably not develop. But in the presence of such a process, a thrombosis might, as in the following cases, be followed by a hydrocele of the cord, which, because of its rapid growth, might, and doubtless does, overshadow its cause, namely, a thrombosed vein.

CASE V.—Father M. K., aged 59, parochial priest. Was first seen November 24, 1906. For eight years he has had a right reducible inguinal hernia for which he has worn a truss. Ten days ago there appeared in the right inguinal canal a hard tender mass which has prevented him from wearing the truss. Notwithstanding this the rupture has not descended. Within the last two days a second swelling causing much pain appeared in the upper part of the scrotum.

Physical examination shows a well nourished man, well except for local condition. On inversion of the scrotum an irregular nodular tumor can be felt in the inguinal canal which is very firm and rather tender. Below this in the upper part of the scrotum, there is a swelling as large as a plum of uniform outline and very sensitive. The tip of the finger passed through the inguinal canal above the upper swelling readily enters the abdomen and an impulse on coughing can be readily felt. The

diagnosis of thrombosis with secondary cyst formation in the cord was made.

Operation at the Good Samaritan Hospital, December 1, 1906. On splitting the aponeurosis of the external oblique as in the ordinary hernia, there was exposed in the cord a thrombus in process of organization. The vein above the thrombus was patulous. The clot measured an inch and a quarter in length and three quarters of an inch in width. It was of dark red color and of uniform consistence and outline. Below it there was a hydrocele of the cord containing perfectly clear fluid and with a sac of uniform surface and clothed with endothelium. (Fig. 1.) The hernial protrusion of the peritoneum was separated by a considerable interval from the uppermost portion of the thrombus. The thrombus and hydrocele of the sac were easily excised, and the hernia treated in the ordinary way. Recovery was uninterrupted. There has been no recurrence either of the hernia or of the hydrocele.

Case VI.—Miss R. F., aged 28. Entered the Jewish Hospital, February 18, 1901. Has been well until four months ago, when after a severe strain she felt considerable pain in the right inguinal region. Although it caused her to limp some, it did not keep her from her work as a saleslady. She had quite forgotten this seemingly trifling condition, when about the first of December she noticed a swelling in the groin which gradually increased in size and without any special symptoms. When lying down it disappeared. A physician was consulted who advised the wearing of a truss. She continued to wear this for about two weeks without benefit.

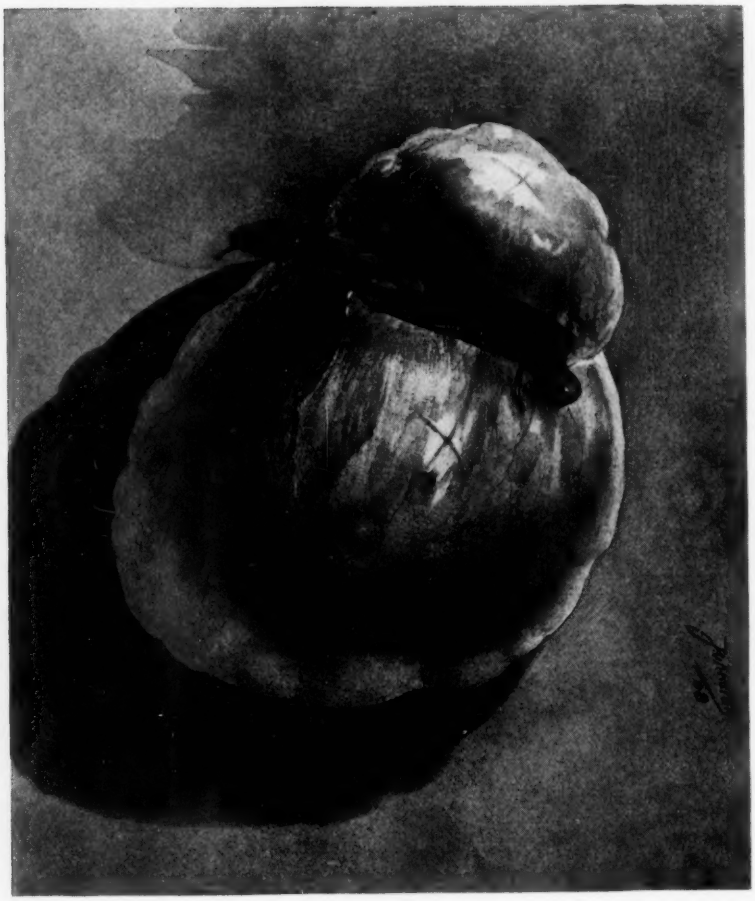
Physical Examination.—Well developed young woman, in excellent health except for the local trouble. Occupying the upper part of the right labium majus and the inguinal canal, there is a rounded swelling with long axis parallel to Poupart's ligament. Above the latter nearly to the superior spinous processes a marked fulness is perceptible. On lying down the swelling of the labium disappears either spontaneously or on pressure, and the examining hand on the abdomen can readily feel the distension of the upper portion of the sac. A distinct impulse on coughing exists. With the patient standing, the translucency of the labial part of the sac is easily demonstrable.

The diagnosis of hydrocele of the round ligament was made.

FIG. 1.

Thrombus of spermatic vein. Sac below. (Case 5)

FIG. 2.



Bilocular cyst of round ligament ; Thrombus. Larger part of sac intraparietal. (Case 6.)

The operation was performed on February 19, 1901. The sac was easily exposed and appeared lobulated by reason of its constriction at the ring. The labial portion of the sac was easily enucleated. The intra-parietal portion, however, was deeply adherent to the parietal peritoneum from which, however, it was dissected without wounding the latter. Its firmest connection was with the round ligament where a firm reddish cord, still seen in the specimen, may have been what remained of the thrombosed vein. (Fig. 2.) After the operation, the cyst which appeared bilocular before, was shown to be unilocular. It was very thin walled and evidently of the round ligament. The operation was concluded as an ordinary hernia.

That the obstruction and thrombus formation is oftener in an omental vein than the spermatic is evident from the relative frequency with which cysts are found in connection with irreducible hernias. A mass of omentum adherent at the neck of the sac, or an obstructed appendix will not infrequently be found associated with the separation of a part of the hernial sac from the larger portion above and the effusion into it of a serous liquid. What comes on in a rapid way in a strangulated omental hernia during the first few hours is of slow development in these chronic cases. In the latter there is never any admixture of the fluid with blood. Quite recently I saw a young man with a hernia which had been retained by a truss. A few weeks before he came for observation a rather large swelling formed just without the external ring. It was as large as the end of the thumb, smooth in outline and ovoid in shape. It was distinctly translucent and irreducible. In the inguinal canal there could be felt an irregular mass seemingly a protruded fold of omentum which had become adherent.

In contradistinction to these cases of cysts of the inguinal canal and of the upper portion of the spermatic cord, which in my judgment are the result of either venous obstruction or of thrombosis, are the cases in which the history of trauma or of a pre- or co-existing hernia cannot be obtained. These are cases in which the cysts of the spermatic cord or of the round liga-

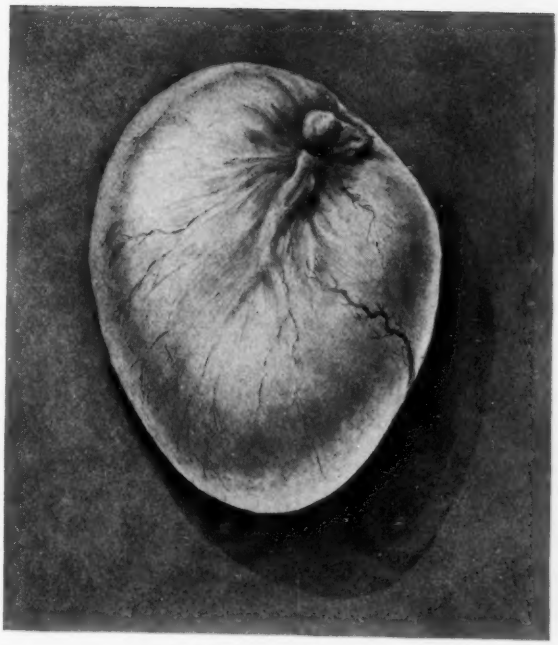
ment develop quickly, and at times with symptoms violent enough to suggest a hernial strangulation.

An analysis of the cases which have come under my observation and of which I have four specimens, shows them to be thin walled, lined with a flattened epithelium and containing a clear fluid, characteristic of the ordinary hydrocele (Fig. 3). The question arises whether in cases of ordinary hydrocele of the cord anything else can enter as an etiological factor than the embryonic rests of the vaginal process from the peritoneum through which the testicle descends or the round ligament passes.

So far as I know, the theory that these cysts may be overgrowths from vestiges of the Wolffian bodies, has nothing to support it. It is questionable, too, whether a hydrocele can occur in the cellular tissue of the cord or of the round ligament, without any preëxisting virtual cavity such as a partly obliterated vaginal process. In women particularly it has been questioned whether a hydrocele of the canal of Nuck is an anatomical possibility. The studies of a number of German anatomists seem to have established the existence of such a process. Although its patulousness is far less common than it is in male children, Bergmann found it open along its entire length in five and partly so in twelve subjects between one month and three years old. Furthermore, it is unusual for cysts, except as a result of trauma, to develop in cellular tissue. The analagon of a hydrocele in the neck is nearly always a branchial cyst. Cysts in the inguinal canal, unless formed in a sequestered portion of the sac of a hernia, with or without thrombosis as an etiological factor, are practically always the result of an exudation into the preëxisting unobliterated portion of the vaginal process. That most of these cases occur in the young is explained on this basis. That it may occur in the old is shown by the following case:

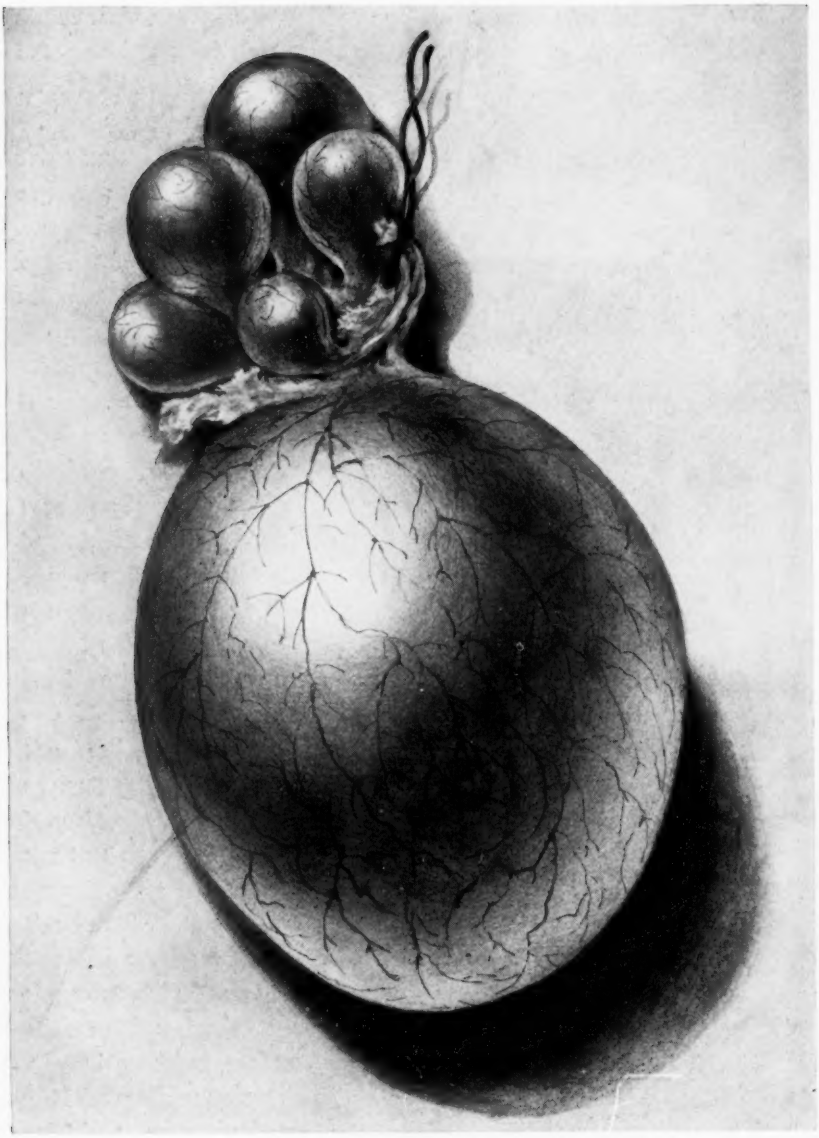
Case VII.—D. L., male, aged 61, was well until a year ago when there appeared a swelling in the right inguinal region. With ordinary symptoms of a reducible hernia there gradually

FIG. 3.



Simple cyst of the spermatic cord. (Scrotal.)

FIG. 4.



Conglomerate inguinal cyst of the spermatic cord (Case 7.)

developed an irregular growth in the inguinal canal and projecting into the scrotum. For about six months before the patient came under my observation the mass had become irreducible.

Physical Examination.—Very well preserved and rugged man without other blemish than the local condition referred to. Occupying the region of the inguinal canal and the upper part of the scrotum there is an irregular mass elastic to the touch and presenting a distinct impulse on coughing. It was entirely irreducible. Because of the ease with which the mass was shown to be translucent, the diagnosis of hydrocele of the cord was made. The operation at the Good Samaritan Hospital March 28, 1898, revealed a cyst conglomerate extending within the abdominal cavity and pushing the peritoneum before it. (Fig. 4.) The individual cysts varied in size from a peach to a bean, but did not communicate with each other. They were filled with a particularly clear fluid and were lined with the flattened endothelium of serous sacs. The operation was completed as an ordinary hernia.

It is impossible to state what, without the history of an injury, could have caused an effusion into these embryonic peritoneal rests after more than sixty years of an innoxious desuetude. A case has been recorded by Cenas (quoted by Broca) in which during an attack of acute articular rheumatism a hydrocele of the spermatic cord developed which completely subsided with the disappearance of the general infection. My patient did not have rheumatism.

It is rather difficult to account for the multilocular development of the cyst in the case presented. It is not unlikely that vestiges of the vaginal process, irregularly distributed along the cord, developed simultaneously into separate cysts without communicating with each other or with the general peritoneal cavity. It is characteristic of a true hydrocele of the spermatic cord that it has not any communication with the peritoneal cavity in contradistinction to the open hydrocele, which rapidly or slowly may empty itself into the abdomen and disappears. A seeming reduction of the tumor into the abdomen may take place in the true hydrocele of the cord or round

ligament, when as in case six a large portion of the cyst is above the internal ring and yet on the outside of the peritoneum between it and the muscular portion of the abdominal wall in front. These are the so-called bilocular hydroceles, a part of which appears in the labium or the upper portion of the scrotum and the other portion above the internal ring, and yet separated from the abdominal cavity by an intact peritoneum. It appears that in these cases by the upward growth of the true cyst, the parietal peritoneum is dissected away from the anterior wall in front much as it is in the intra-parietal forms of hernia. Indeed, in many of the cases of bilocular hydrocele hitherto recorded, there has been found, as in properitoneal hernias, some anomaly of position of the testicle. Diverticula of the vaginal process added to the great mobility and ease of displacement of the peritoneum about the internal ring, will readily account for the disappearance of the bilocular inguinal hydrocele. Its appearance during early life and in the young supports the view that in many cases there is an anatomical congenital anomaly as a basic factor.

In the above considerations, cysts of the lower part of the cord and those in conjunction with the testicle have not been considered. Like the organ of Giraldes, an embryonal rest of the Wolffian body, cysts may develop in connection with the upper part of the epididymis from this structure. They never, however, extend to the inguinal canal and are closely fixed to the testicle.

Nor has more than reference been made to the cysts of the inguinal canal and the upper part of the scrotum, which are due to the sequestration of a portion of a hernial sac and the accumulation within it of a serous transudate. The condition of a hydrocele in a part of a hernial sac is often enough encountered and thoroughly understood.

The diagnosis of thrombosis and of hydrocele of the cord within the inguinal canal and projecting beyond the external ring ought under ordinary circumstances present no difficulties. In the cases of thrombosis above described the diagnosis was easily made, and in the hydroceles which followed or developed

without preëxisting thrombosis, the light test sufficed to clear up any doubt which might have existed. Nevertheless, thrombosis of the spermatic veins and an acute hydrocele may set on with such severity of symptoms as to simulate almost in every particular a strangulated hernia. In exceptional cases too, a differential diagnosis between thrombosis of the cord and thrombosis of an omental protrusion cannot be positively made until the parts are exposed by operation. Fortunately in either event an error in diagnosis would only accrue to the benefit of the patient in that an early operation would be insisted upon and probably performed.

The treatment of the conditions under consideration is simple enough. In the milder cases of thrombosis, expectant treatment is indicated. In those of larger dimensions following a trauma or in which from the size of an hematocele a positive diagnosis from hernia cannot be made, an operation is indicated. In hydroceles the older methods of aspiration and of injection have been rightly discarded. Complete excision of the sac is the only advisable procedure. Although in a considerable proportion of cases (as in the bilocular) the enucleation would involve the properitoneal space, the operation does not present insurmountable difficulties. In hydroceles resulting from sequestration of a portion of the sac, the operative treatment is that of an ordinary hernia. It is almost needless to conclude with the injunction that the operation, when complete, must leave the inguinal segment of the abdominal wall as competent to resist pressure as after the ordinary hernia operation.

COMPARATIVE VALUE OF VARIOUS MEASURES FOR RELIEF OF PROSTATIC ENLARGEMENT.

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In the pathology of prostatic enlargement, there is usually not enough stress laid upon the trophic changes that occur in the bladder. These changes, the result of the disturbance of the circulation from the bladder, are occasioned by the compression of the valveless vesico-prostatic veins through the increasing growth of the prostatic gland. Usually the attention is directed, almost if not entirely, to the obstructive disturbance exerted upon the urinary outflow. As the result of this venous disturbance the muscular coat acquires connective tissue at the expense of muscular fibres, thereby impairing the contractility and expulsive power of the bladder. Due to this disturbance the bladder, with its impaired tonicity when filled with urine, sags into the pelvis while the neck is firmly held against the pubes by the pubo-prostatic ligaments, in this way forming a retro-prostatic pouch which acts as a reservoir for the residual urine. We have also the formation of trabeculae and between the trabeculae, sacculation through the yielding of the bladder wall. The mucosa by its impaired resistance becomes more sensitive, more susceptible to inflammatory changes as evidenced by the frequent urination.

In the treatment, much depends upon; first, the care with which these cases are selected and prepared for operation; secondly, the rapidity and ease with which they are operated upon, *i.e.*, the shortest time, the least exposure, the most careful manipulation, and the minimum amount of hemorrhage; lastly, the carefulness and gentleness with which these patients are nursed. Old and more or less decrepit, they make constant demands upon the nurse, who is able to influence, not alone the ultimate outcome of the case, but to aid the early convalescence

as well as adding immeasurably to the comfort of the patients during their illness.

The operative procedures for the relief of this condition have been narrowed practically to prostatotomy or the Bottini operation, and to prostatectomy:

- Prostatectomy
  - Suprapubic
  - Perineal
    - Blind enucleation
    - Open dissection

Prostatotomy, or the Bottini operation, has played an important rôle in the development of prostatic surgery, and is still an eligible procedure in the extremely old, or especially those afflicted with some serious cardiac, renal, or other underlying trouble, making them undesirable subjects and justifying a temporizing operation. It is the opinion of some surgeons that aside from the cases just indicated it is frequently a desirable procedure in the small, hard, fibrous prostate, which is always difficult of removal, and which, if removal is attempted, should if possible be by the perineal route with an open dissection.

The objections to it as a procedure of general employment are that the incisions made by the cautery are uncertain as to their depth, location or influence upon the gland, and dealing only with the obstruction to the urinary flow, leave untouched that which is equally if not more important, namely, the interference with the venous drainage of the bladder wall. Lastly, as applied to the general class of cases, its mortality is hardly equal to perineal enucleation, which aims at the whole trouble.

The most urgent question in connection with this subject, however, is the choice between the suprapubic and the perineal method. While the most ardent devotee usually concedes that there is a place for the opposite method to the one he espouses, there is frequently hardly enough of this concession. It would be better if there existed a greater desire to see the good in

the other side rather than be blindly absorbed in the advantages of the method elected. However attractive the arguments in favor of one method as opposed to the other may be, the verdict in the end must be determined by the mortality. The surgeon who ignores this, at once assumes the burden of proving that mortality in surgery is but of secondary importance, and of demonstrating why the so-called best operation which he espouses has a higher mortality than the operation which he renounces as not as good.

Statistics can be arranged from many angles, but when we arrange the results of the best operators of the different methods we believe that such statistics represent a fair presentation of the case, especially, when the different statistics of the different investigators are practically harmonious.

The following statistics by Watson (Francis S. Watson, Operations for Prostatic Hypertrophy, ANNALS OF SURGERY, vol. 39, p. 855) represent the mortalities of the two methods in the early portion of the recent period of prostatic surgery:

	Cases.	Death.	Mortality
PERINEAL TOTAL REMOVAL.			
Goodfellow	74	2	
Albarran	59	2	
Proust	30	0	
Pauchet	20	1	
Rafin	20	1	
	203	6	2.9 per cent.
SUPRAPUBIC.			
Freyer	45	5	
Moynihan	12	1	
Mayo Robson	12	0	
	69	6	8.6 per cent.

According to Cunningham (John H. Cunningham, Jr., Boston Medical & Surgical Journal, No. 19, 1907, p. 602) the mortalities of the existing methods for the treatment of senile hypertrophy of the prostate are:

	Cases.	Per Cent. Mortality.
Catheterization	207	7.7
Palliative operations	168	36.9
Partial prostatectomies	167	19.1
Bottini operations	1289	5.3
Total suprapubic prostatectomy	406	9.6
Total perineal prostatectomy—		
1. Dissecting	563	5.5
2. Enucleation	192	4.7

The following collection of cases is illustrative of suprapubic mortality:

	Cases.	Per Cent. Mortality.
Proust	224	12.0
Watson	263	13.3
Escart	164	18.0
Terney & Chase	396	9.8
Freyer	205	7.3

Following is a list of the most recently reported cases of the perineal dissecting operations with their accompanying mortalities:

	Cases.	Per Cent. Mortality.
Young	150	4.6
Ferguson	103	3.6
Albarran	73	4.0
Hartman	56	9.0
Pauchet	53	7.0
Legneu	45	8.8
Murphy	51	3.9
Rafin	32	6.2
Total number of cases	563	
Average mortality		5.5

MEDIAN PERINEAL PROSTATECTOMY—BLIND ENUCLEATION.

	Cases.	Per Cent. Mortality.
Syms	34	5.6
Watson	54	8.0
Goodfellow	78	2.5
Cunningham	24	0.0
Total number of cases	190	
Average mortality		4.7

Freyer (British Medical Journal, Oct. 5, 1907) reports 432 suprapubic operations, with 29 deaths, or a mortality of 7 per cent.

Zuckerkandel (Wiener klinische Wochenschrift, No. 40, p. 1200) reports 60 prostatectomies, 30 by the perineal method, with a mortality of 4 per cent. and 30 by the suprapubic, with a mortality of 7 per cent. This same author has noticed a condition of anesthesia in the posterior urethra that existed in patients after a perineal operation that did not exist after suprapubic operation, showing a nerve injury in the perineal operation that does not occur in the suprapubic.

The statistics are harmonious throughout, namely, that the perineal operation is almost twice as safe as the suprapubic. The other difference noted in studying these statistics is a difference in the mortality between operators of the same class, *i.e.*, different operators doing the suprapubic operation and different operators doing the perineal.

The difference in the mortalities of operators of the same class can be explained on the basis of personal equation, more experience, and lastly, the more careful selection of cases and operative conditions; the latter as proper up to a certain point as it is improper beyond that point. A low mortality is sometimes acquired by denying certain cases the right of surgical relief because their outlook is not promising. The statistics of Cunningham, which indicate a mortality of 5.5 per cent. where the operation consists of the open perineal methods, compared with the more favorable mortality of 4.7 per cent. where the blind enucleation is practiced, are significant in demonstrating that the simpler and quicker the operation is performed the lower will be the mortality. There are many surgeons who have yet to be convinced that the suprapubic is simpler than the perineal. That less important structures are divided, that less hemorrhage is encountered, that less injury to the bladder is sustained, that drainage is better, convalescence shorter and fistulæ rarer in the suprapubic than in the perineal. We are inclined to suspect that the reverse is true even though trustworthy men have done the suprapubic

enucleation in two minutes or less whatever that may mean. and we further suspect that because the reverse is true the mortality is higher.

There has been a difference of opinion among the operators favoring the perineal method as to whether the gland should be removed by blind enucleation or through an open dissection. Those favoring the open dissection contend that the blind enucleation is opposed to well-grounded surgical principles in that the work is done in the dark, and that by this method there is a needless sacrifice of the ejaculatory ducts.

It would seem that this question would depend more upon the age and vigor of the patient than upon the two objections just enumerated. While good exposure of the operative field is a well-grounded principle in surgery, experience proves that the advantages gained by the free exposure are offset by a higher mortality which can only be explained on the ground of more time, exposure and manipulation. Furthermore, results prove that exposure to ocular inspection is not necessary to obtain satisfactory results.

As to the second objection, the needless sacrifice of the ducts, we might with justice speak of this as making, in the majority of instances, " the most out of the least," particularly where the subject is an old one. Blindly enucleating the gland does not necessarily mean the destruction of the ducts, any more than open dissection necessarily means the conservation of the ducts, although we are always prepared to lose them in the blind method; and expect to save them by the open dissection. The potency which these subjects as a rule possess is at a very low ebb, if it exists at all, and if we preserve this, which we admit should be attempted in the younger class of cases, it must be remembered that the subject is expected to be sterile if a total enucleation of the gland is carried out; and the teaching of the functions of the prostatic secretion is accepted.

The chief factors in the mortality are uraemia or renal insufficiency, sepsis, shock, and post-operative and pulmonary complications which Watson arranges in frequency as follows:

	Per Cent.		
Bottini	2.70	" "	Uremia (or renal insufficiency
Perineal operations	35.0	" "	
Suprapubic "	34.0	" "	
Bottini	52.0	" "	Sepsis
Perineal operations	17.8	" "	
Suprapubic "	8.6	" "	
Bottini	5.0	" "	Shock
Perineal operations	21.4	" "	
Suprapubic "	30.0	" "	
Bottini	8.0	" "	Post-operative pulmonary complications
Perineal operations	17.8	" "	
Suprapubic "	22.0	" "	

There is scarcely any difference in the degree of danger between the perineal and the suprapubic operations so far as uraemia or renal insufficiency goes, and not a very great difference between these two and the Bottini operation. As to sepsis the mortality is about seven times greater in the Bottini than it is in the suprapubic, and about twice as great in the perineal as it is in the suprapubic. This can be explained by the better drainage, not so far as the urinary element is concerned, as better drainage of the secretions accumulating in the cavity from which the prostate has been enucleated.

Deaver (in the Pennsylvania Medical Journal, No. 11, v. 10) says: " The prostate lies upon the triangular ligament and above the aponeurosis of Denonvilliers; neither of these structures so important in completing the floor of the pelvis, is divided when the prostate is lifted off them and delivered into the cavity of the bladder. This explains the difference in the percentage of sepsis in the three procedures, and to a large extent likewise explains some of the better end results through the suprapubic method, such as less disturbance of the control."

As to the question of shock, these tables show 5 per cent. for the Bottini, 21.4 per cent. for the perineal and 30 per cent. for the suprapubic, pointing unmistakably to the operation having the most and the least operative interference.

Under the head of post-operative complications we have

8 per cent. for the Bottini, 17.8 per cent. for the perineal and 22 per cent. for the suprapubic. These figures are readily explained on the basis of the Bottini requiring little or no time in bed and the suprapubic requiring the longest time and consequently attended with the highest per cent. of post-operative complications.

The ease and rapidity with which the prostate can be enucleated by either the suprapubic or perineal method has been a strong temptation to its total removal at one sitting and thereby remove the offending member. We believe with Chetwood, Cabot and others that there are some cases that could be more successfully handled if dealt with in two stages. In extremely old and feeble, or where the bladder condition is unsatisfactory, a preliminary cystotomy followed in ten days or two weeks by enucleation will be attended with more successful results than if dealt with by one move as Cabot (Boston Medical & Surgical Journal, Oct. 24, 1907, p. 556) very tersely suggests, " if the preliminary cystotomy kills, a prostatectomy would have been foolhardy. If the patient recovers from the little blow, he usually rapidly gains strength; the prostate become less congested, the cystitis disappears and we have procured a change which usually permits a successful enucleation later."

CONTRIBUTION TO THE SURGERY OF THE PROSTATE.*

A. THE RESTORATION OF VOLUNTARY CONTROL OF THE URO-GENITAL SPHINCTER IN CASES OF INCONTINENCE OF URINE FOLLOWING OPERATIONS UPON THE PROSTATE. B. AN OPERATIVE DEVICE IN THE TREATMENT OF URETHRO-RECTAL FISTULÆ.

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THE mechanism of the urinary incontinence which occurs sometimes after operations upon the prostate is imperfectly understood. This is very largely the result of ignorance of the physiological mechanism which presides over urination. An examination of the various standard works upon medicine and surgery sheds little light upon this subject, but rather adds to the difficulty, owing to the conflicting statements made therein without adequate explanation.

I question very much whether it is possible from our present knowledge to write a strictly accurate description of the complex physiology of the urinary act. It is certain, however, that much of the confusion which now exists can be removed.

I have endeavored in another place to give as clear a description of the physiology of urination as our knowledge of this complex process permits. I purpose in this paper to present some observations in regard to the cause of certain forms of incontinence of urine and to describe a method of treatment which I have employed for its relief and which I think has not heretofore been suggested.

The class of cases to which I desire to call attention are those in which there is a more or less complete inability to

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retain urine in the bladder owing to partial destruction of the urogenital sphincter, or of its attachments, caused by surgical operation.

During recent years the popularity of prostatectomy in the treatment of obstructive prostatic disease, and the prevailing belief that any surgeon, no matter how limited his experience or knowledge, may perform these operations, has multiplied these cases manifold. I say this advisedly because during the past three years more cases of this kind have been admitted into the service under my charge at Bellevue Hospital than heretofore.

These patients were operated upon in other hospitals, and as a result of the manner in which the operations were performed, their condition was made worse, and ultimately they were transferred to Bellevue Hospital. Many of them according to popular standards could be classed only among the hopelessly incurable.

In some of these cases the obstructing portion of the prostate had been only partially removed, and sufficient obstruction remained to require a second operation for its removal. In other cases the anterior wall of the rectum had been torn and there were at the time of their admission to the hospital large urethrorectal fistulæ. The perineum in these latter cases was little more than scar tissue owing to ineffectual attempts to repair the damage.

In most of these cases there was a more or less constant leakage of urine either into the rectum or through the perineal fistulæ which remained open, or through both. In other cases, although the prostate had been removed, so much damage had been done to the urogenital sphincter that there was more or less constant dribbling of urine through the urethra.

As most of these patients were advanced in years, weakened physically by disease, and by a prolonged convalescence after serious surgical operations, the prospect of any ameliora-

tion of their symptoms seemed remote. The treatment of these cases, however, was undertaken, with a determination to spare no time or pains to accomplish a cure.

We may for convenience divide these cases of incontinence into two classes, viz.:

a. Those complicated by urethrorectal fistula.

b. Those not complicated by urethrorectal fistula.

The cause of the urinary incontinence in all of these and similar cases is, I believe, due to more or less destruction of the fibres of the urogenital sphincter muscle, or to a malposition of the attachment of the fibres of parts of this muscle so that they can act only at a disadvantage. The coordinate action and reaction which normally exists between the intrinsic muscle of the bladder and the sphincter is therefore disturbed. It will be found that incontinence of urine occurs most frequently when the roof of the prostatic urethra and with it the arch which the urogenital sphincter forms in front of the canal is damaged. It occurs also more frequently in those individuals who have naturally a more or less atonic muscular mechanism.

The principle of treatment is:

1. To restore when necessary the perineum, the rectal wall and the urethra to a condition as nearly approaching the normal as possible.

2. To teach the individual by exercise, to use what remains to him of the urogenital sphincter muscle, so that he may acquire voluntary control over the retention and expulsion of urine.

When the control of urination by voluntary effort is attained, automatic control will follow as a physiological necessity.

Any atonic or damaged muscle may be made to act, and the power of its action gradually increased by proper exercises.

It is the method of application of these principles of physiology to the act of urination that constitutes the virtue of our treatment.

THE OPERATIVE TREATMENT OF URETHRORECTAL FISTULÆ.

The closure of urethrorectal fistulæ is looked upon as one of the most uncertain and unsatisfactory of operative procedures. The difficulty of keeping the line of sutures free from infection and of effectively draining the bladder, make a failure of these operations the rule rather than the exception. It is therefore a satisfaction to be able to report that I have so far overcome the difficulties formerly encountered, that I have been able to close these fistulæ permanently by a single operation, and by methods which while they require experience and careful nursing, can be successfully employed by any competent surgeon.

It is necessary in these cases of urethrorectal fistula following prostatectomy to determine first, whether all obstructing portions of the prostate, especially all intravesical projections, have been removed, and whether the bladder is free from calculi. I mention these facts because I have met with cases in which not only was the prostatectomy incomplete, but in which calculi, and in some instances encysted calculi were found in the bladder.

When these conditions are present they should be removed, and the prostatic urethra and vesical orifice should be made even and smooth to the touch before an attempt is made to close the urethrorectal fistula.

To close the fistula the patient is prepared by a few days' purgation with castor oil and the bowel is washed out thoroughly at the time of operation.

With the patient in the lithotomy position a curved incision is made in the perineum in front of the anus, extending from one tuberosity of the ischium to the other; the central portion of the perineum is divided and the dissection is carried upward between the rectum and the prostate so as to expose the wall of the rectum externally for at least ½ inch above the upper margin of the fistula.

This dissection is to an inexperienced surgeon difficult; for after the prostate has been removed the tissues are very

thin between the rectum and the urethra. It will be found that more space in the perineal wound can be obtained by dividing the origin of the transversus perinei muscles from the ischium, or at least the more superficial part of these muscles.

The edges of the fistula should be separated from the urethra by cutting with a sharp knife and scissors and not by blunt dissection. The edges of the urethra at the seat of the fistula should be carefully refreshed by cutting away all overgrowing mucous membrane from the urethra, but the urethra should not be sutured.

The tissues about the fistulous opening in the rectal wall are then refreshed with curved scissors and made smooth. All hemorrhage should be stopped and the wound made as dry as possible. The opening in the rectal wall is then closed by interrupted Lembert sutures of chromicized catgut placed from the perineal side by means of a round curved needle. These sutures should not include the mucous membrane of the bowel. One suture should be placed well above the upper margin of the opening and one well below the lower margin. It will be found convenient to introduce the sutures from below upward, and not to tie any suture until all have been placed.

After the opening into the rectum has been closed the bladder and bowel are to be irrigated by means of a metal tube. During this process the bowel should not be distended. No drainage tube is put into the bladder.

To protect the line of suture in the rectal wall I have devised the following expedient: A small triangle of gauze consisting of six or eight layers is made to fit the wound. The apex of this triangle is carried by forceps up to and behind the vesical orifice. Between the layers of gauze, a 10 per cent. iodoform ointment, made with vaseline, is then injected from a glass syringe and the little pad is then plastered down so as to fit the posterior surface of the perineal wound accurately.

As the urine flows from the bladder over this pad it is shed off this as water is from a duck's back.

The gauze is to be changed twice or three times a day, or oftener if the pad becomes displaced.

The external wound is then dressed by gauze pads to absorb the urine as it flows out of the wound.

I have usually confined the bowels by the use of opium for one week, and have then given a dose of castor oil and have superintended the giving of an enema at the time of the first movement.

On each day during the first week I introduce into the rectum a metal tube and wash out the lower bowel without distending it, and then inject into the rectum about one or two drachms of iodoform ointment. I am now able uniformly to get solid union of these fistulæ. It requires, however, attention to minute details and good nursing and careful watching. The results are a full compensation for the work.

The perineal wound is given the most careful attention during cicatrization so that it will fill in from the bottom without fistula. Sounds are passed after the first ten days as they may be required to keep the urethra free from stricture and to make its walls smooth.

THE RESTORATION OF VOLUNTARY CONTROL OF THE UROGENITAL SPHINCTER.

After restoration of the rectal wall and of the perineum these cases of urinary incontinence come into the second division of our classification and are to be treated as the cases of incontinence not complicated by urethrorectal fistula.

Every surgeon who has had extensive experience in the performance of prostatectomy has encountered these cases, and the occurrence of this disability has frequently been presented as an argument against the operation. Happily the great majority of cases of prostatectomy skilfully done do not suffer from this disability. But there is a sufficiently large number that do so suffer and so far as I know no adequate method of treatment has heretofore been suggested.

The method which I now present has had an extensive

trial during more than three years and the results which have been obtained have justified our most sanguine expectations.

I had the honor to show to the Society of Clinical Surgery at their meeting in New York last October a large number of the cases which form the basis of this paper, and give a practical demonstration of the method of treatment by which these patients had been cured.

This inability to retain the urine as I have said may be more or less complete and I have seen the following different degrees:

1. There may be what is practically if not literally a complete incontinence. The action of the urogenital sphincter seems to be abolished and the urine almost as fast as it flows from the ureters into the bladder, flows out through the urethra, drop by drop. The flow is usually intermittent, and corresponds to the intermittent flow from the ureters.

2. The bladder may be able to retain a small quantity of urine, but when this amount is exceeded there is leakage.

3. The leakage may be intermittent, occurring at certain times during the day. There is often no leakage during sleep, nor for several hours after rising in the morning, but toward evening when the patient becomes physically tired, there is more or less incontinence.

4. The patient may have perfect control while sitting or lying down, but when standing or walking, there is involuntary leakage.

5. There may be leakage immediately after the urinary act, caused by retained urine in the urethra as the result of an atonic condition of the urethral walls.

These different degrees of disability are subject to infinite variation.

The effect of this inability to retain the urine, upon the minds of men naturally feeble, or made feeble by sickness and by disappointment, is often lamentable. And it is very necessary to arouse in the minds of these patients the hope that their disability is not a permanent one. The influence of suggestion here is undoubtedly great, and no time or pains should

be spared to impress them with the reasonableness of a promise to cure them. This is essential, because without the hearty and intelligent coöperation of the individual patient a cure is impossible. On this account and to accomplish the best results, I have adopted the plan of treating several patients together in the hospital; so that those who are beginning to be taught to gain urinary control may be encouraged by those who have been taught, or who are at least further advanced toward a cure than they themselves are.

The method of instruction must vary with each case, but a general idea of the plan pursued in most cases may be given in outline.

The principle of treatment is to make the individual learn by practice to exercise voluntary control over what remains of the urogenital sphincter, thus to prevent the escape of urine. If this can be done, automatic control follows as a physiological necessity.

The difficulties to be overcome are greater than they might at first seem because in some of these cases there has been a very extensive destruction of the urogenital sphincter, by the improper performance of the prostatectomy. Yet even in the seemingly hopeless cases it is surprising to find how readily the parts remaining of this complex muscular mechanism which we call the urogenital sphincter may be trained to compensatory work.

The first step in accomplishing this result is to accustom the individual to moderate bladder distention. A catheter is introduced through the urethra and a warm saline solution is injected. The quantity injected should be just short of that sufficient to excite vesical contraction and a desire to pass urine. The catheter is then closed by the finger and the individual is instructed and urged to exert himself to retain his urine; this is continued for several minutes; then continuing to urge the patient to "hold his water" the catheter is withdrawn. The fluid from this bladder is usually at first expelled, but the patient is urged during the entire time to prevent its escape.

This procedure is repeated several times and with varying quantities of fluid.

After a few days it will be found that the ability to retain some of the fluid injected is acquired. This fact should be pointed out to the patient and he should be encouraged in his efforts. He should be instructed to make voluntary effort to control the escape of urine whenever he can.

After he has acquired the ability to control the injected fluid in the recumbent position, he is taught to control it when moving, when getting out of bed, when sitting down and when performing certain mild calisthenic exercises, as raising first one foot, then the other foot; sitting down and then arising. These actions are at first done with deliberation, then more rapidly.

In order to prevent leakage it is important to see that the urethra is completely emptied after each act of urination. In old men whose muscular structures are relaxed, or in whom the accelerator urinæ muscle has been injured the urethra does not empty itself and the presence of urine in the canal excites the contractility of the bladder and causes dribbling of urine. The patient is instructed to press upon the perineum with the fingers and to strip the urethra after each act of urination.

As soon as he has acquired any voluntary control, he should be instructed to urinate at frequent intervals and each act of urination should consist of an exercise of interrupted urination, viz., to begin the act, to cut off the flow; to begin again, to control the flow.

At first all of these exercises must be done under supervision; and the rapidity with which the results are obtained will depend in a measure upon the intelligence of the individual and his coöperation in the treatment. An ignorant, discouraged, sulky old man is hard to teach; but it can be done if one gives the time and energy necessary.

MUSCULO-SPIRAL (RADIAL) PARALYSIS DUE TO DISLOCATIONS OF THE HEAD OF THE RADIUS.

WITH ESPECIAL REFERENCE TO THOSE CASES COMPLICATING FRACTURE OF NEW YORK,

BY DE WITT STETTEN, M.D.,

OF NEW YORK

Assistant Visiting Surgeon to the German Hospital.

THE question of injury to the musculo-spiral nerve, perhaps the most frequently affected nerve in the body, has been treated exhaustively in the medical literature, but that particular form due to dislocations of the radial head has been surprisingly neglected. The scant respect shown this important combined lesion which represents a distinct pathological and clinical entity, its comparative frequency and practical significance, and the possibility of a completely successful surgical treatment of the condition have induced the writer to report, in detail, the following case which first came under his observation while he was house-surgeon at the German Hospital, New York. In connection with this report, he has reviewed the literature of the subject, laying particular stress upon those cases complicating fracture of the ulna, and finally, he has made a number of cadaver experiments to determine the anatomical relations of the dislocated radial head to the musculo-spiral nerve.

Patient F. P., printer, aged 19. On August 12, 1903, while the patient was winding a cable of a theatre curtain, the crank slipped from his hand, reversed, and forcibly struck his right forearm. He was unable to use his arm, and a doctor made the diagnosis of fracture of the ulna. The patient states that shortly after the injury he noticed that he could not extend his wrist or fingers, and that the back of the hand and half of the fingers felt numb. The arm was put in a splint, which was worn for four weeks, and when this was removed there was decided impairment of the function of the elbow, while the condition of the

wrist, hand, and fingers was unchanged. These functional disturbances persisted until the patient's admission to the German Hospital, New York, on November 13, 1903, three months after the injury.

EXAMINATION.—*Inspection* of the right forearm shows a depression on the ulnar side at the junction of the upper and middle third and a marked prominence on the radial side of the cubital fossa. There is a drop-wrist. The forearm is atrophied and the skin of the dorsum of the hand looks bluish and glossy.

Palpation reveals a distinct deformity of the ulna corresponding to the depression and caused by a bowing of the bone, forwards and radially. The fragments are firmly united; there is considerable callus at the point of fracture; the angle formed by the two fragments is about 160 degrees; the upper fragment is displaced inward and backward, the lower outward and forward. The prominence in the bend of the elbow is the radial head, resting on the lateral condyle of the humerus. It is slightly thickened. It rotates in pronation and supination. The dorsum of the hand is cold.

Active Motion. At the Elbow.—Flexion is limited to about 100 degrees. Extension is unaffected. Pronation and supination are somewhat restricted, particularly the latter.

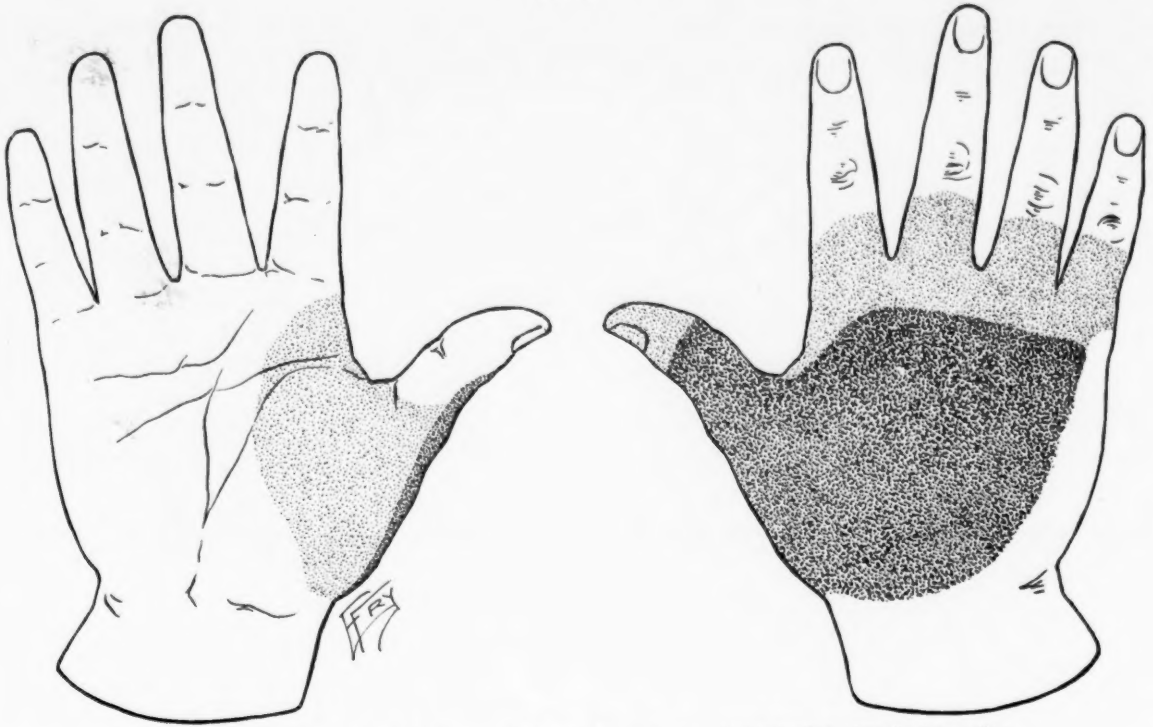
At the Wrist.—Flexion is normal. Extension is only possible for about 15 degrees from the drop-wrist position. Abduction is slightly limited. Adduction is not impaired.

At the Fingers.—Flexion is normal. The proximal phalanges and the thumb cannot be, while the two distal phalanges of the four fingers can be extended. The abduction and adduction of the four fingers are normal, but the thumb cannot be abducted.

Passive Motion.—Flexion, pronation, and supination at the elbow are limited to the same extent as the corresponding active motions. Forcing produces considerable pain. Extension of the elbow and all the movements of the wrist and fingers are passively uninterfered with. The patient's grip is weak, but is somewhat strengthened on passive extension of the wrist.

Sensation.—There is practically a total loss of sensation of the entire dorsum of the hand which extends to the phalangeal joint of the thumb and almost to the metacarpo-phalangeal articulations of the fingers. This area of anaesthesia reaches nearly to

FIG. 1.



Areas of anæsthesia. Dark shading—practically total anæsthesia. Light shading—impaired sensation.

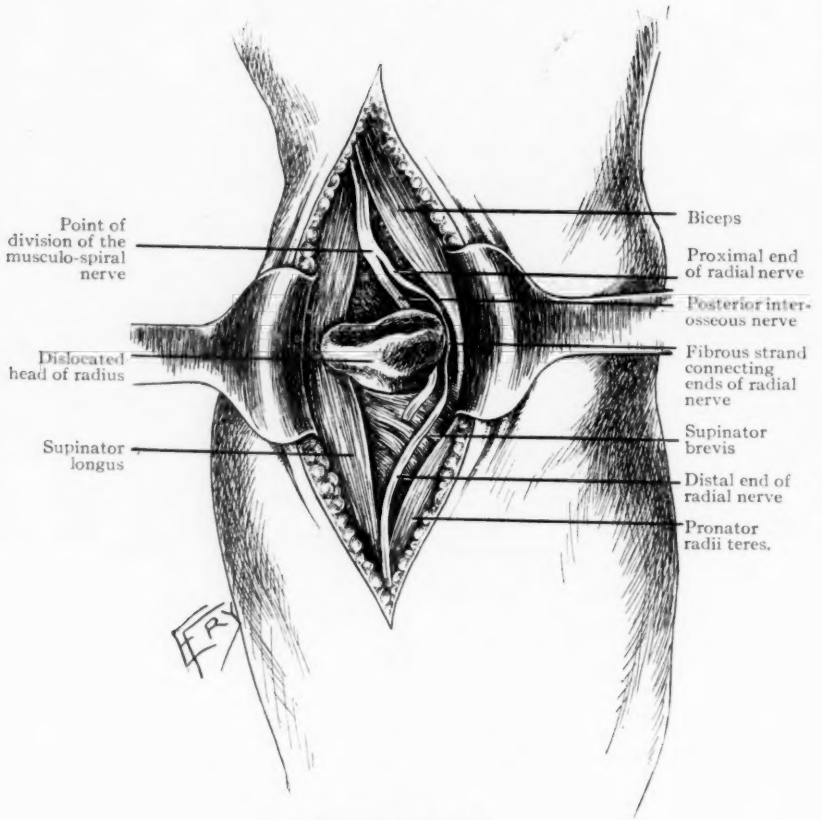
FIG. 2

Skiagram before operation. Flexion. Lateral.

FIG 3.

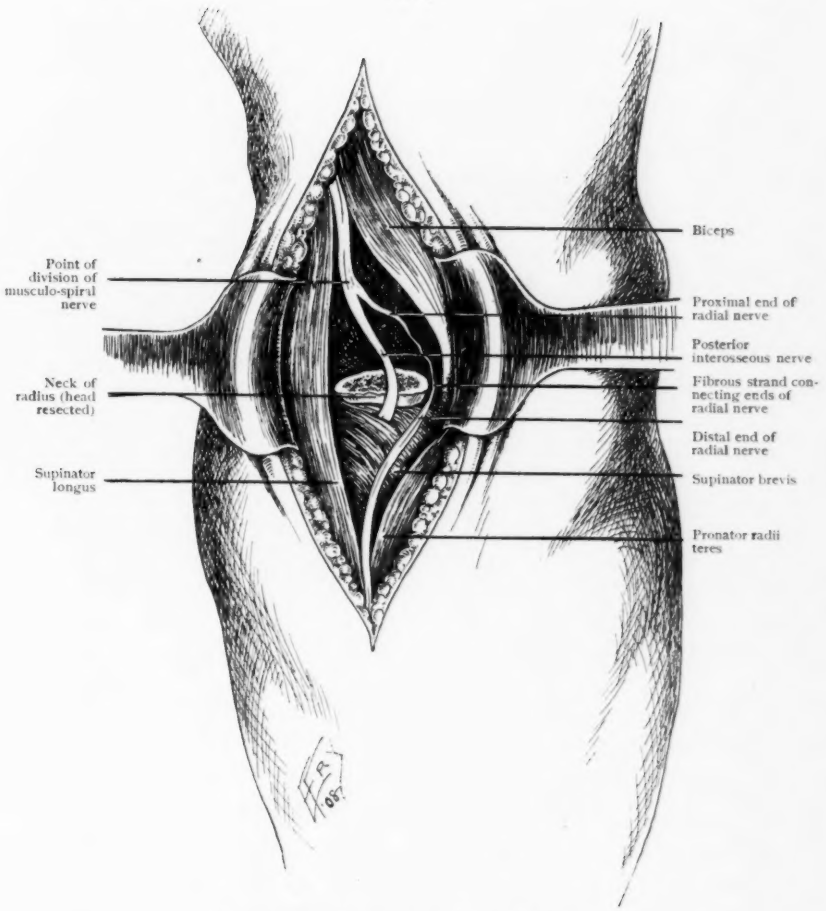
Skiagram before operation. Extension. Anteroposterior.

FIG. 4.



Condition at operation.

FIG. 5



Appearance after resection of head of radius.

the wrist. On the ulnar side of the back of the hand there is a narrow strip of normal sensation. The dorsal surfaces of the distal phalanx of the thumb and the proximal phalanges of the fingers show impaired sensation, as does the thenar eminence. (See Fig. 1.)

Electrical Reactions.—There is a total loss of faradic contractility of the extensor communis on direct stimulation. This muscle is more excitable to galvanism, and A. C. C.>K. C. C. On stimulating the musculo-spiral nerve in the arm, the extensor communis reacts neither to faradism nor galvanism, but the extensor carpi radialis longior and the supinator longus react normally.

Mensuration shows—

	Right.	Left.
Ulna—Styloid process to olecranon	24 cm.	25.5 cm.
Radius—Styloid process to epicondyle	26 cm.	28 cm.
Circumference of forearm 5 cm. below olecranon	22 cm.	24.5 cm.

There is a shortening of the ulna of 1.5 cm. and an apparent shortening of the radius of 2 cm. The atrophy of the forearm is 2.5 cm.

Radiographic examination shows a fracture of the ulna at the junction of the upper with the middle third and a dislocation of the head of the radius forward and slightly outward. There is a moderate deformity of the fractured bone consisting in a bowing forward and outward, the lower fragment overriding the upper and lying internal to it. There is bony union with a fair amount of callus. (See Fig. 2 and 3.)

The diagnosis of the bone and joint lesion being evident, there still remained to be considered the exact nature and site of the nerve lesion, and what measures should be taken to increase the usefulness of the extremity. There was no doubt that there existed a musculo-spiral paralysis, and it was finally decided that this was due to a contusion or a laceration of the nerve, probably produced by the dislocated radial head. It was further concluded that the nerve was probably injured below its bifurcation into the posterior interosseous and radial as it was distinctly observed that the extensor carpi radialis longior, and especially the supinator longus, were not paralyzed. These muscles are supplied before the nerve divides.

The attempt at bloodless reduction of the old dislocation naturally failing, operation was decided upon with the following indications:

1st. To investigate and repair the nerve injury if possible.

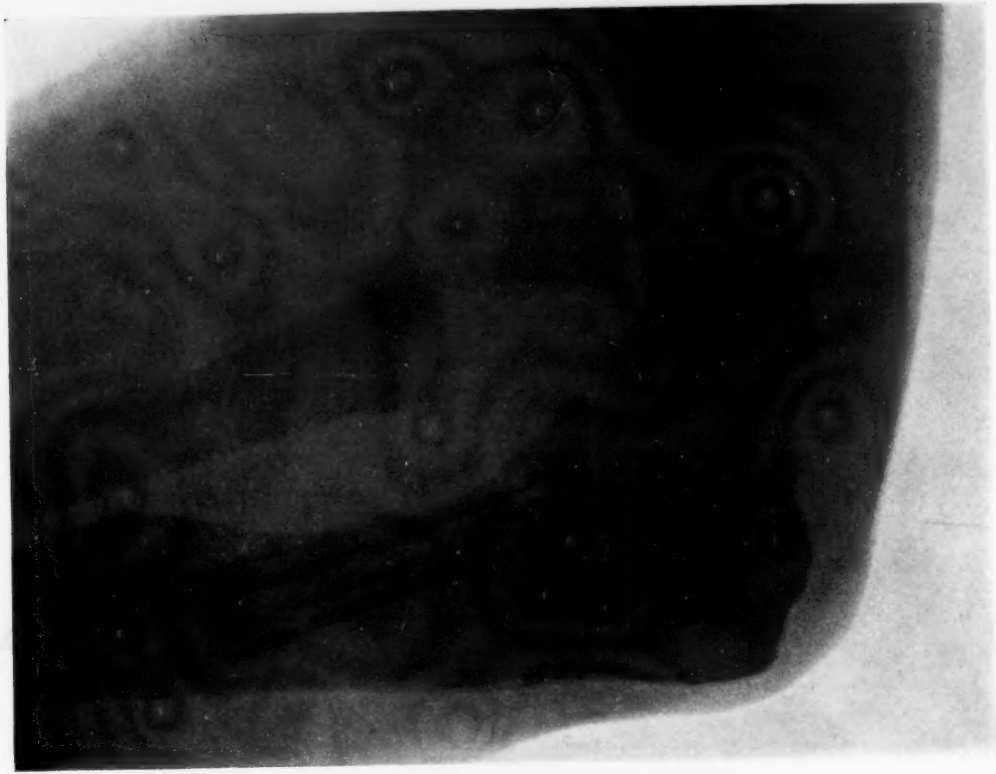
2nd. To increase the flexion of the elbow by either reducing the dislocation or resecting the radial head.

The *operation* was performed on November 19, 1903, by Dr. F. Kammerer.

A 10 cm. longitudinal incision was made directly over the prominent head of the radius. The supinator longus was exposed, and just medially was seen the protruding radial head which had pushed sharply inward the two divisions of the musculospiral nerve. (See Fig. 4.) The head of the bone is somewhat hypertrophied and the cartilaginous surfaces are no longer glossy. Both branches of the nerve are much flattened, and the nerve fibres are apparently ruptured. It seems as if the ends are held together by thin, flat, fibrous strands, the remnants of the nerve sheaths. This is particularly true of the radial branch. After carefully freeing the nerves and pulling them aside, the head of the radius was resected with the Gigli saw and the nerves allowed to return to their normal position. (See Fig. 5.) The wound was closed without drainage, the arm was put in semi-flexion, midway between pronation and supination. The patient made an uneventful post-operative recovery. The wound healed primarily. After a month, the plaster dressing which had been applied was removed, and then under massage, passive motion, and electrical treatment the flexion of the elbow and the nerve function were gradually improved. When the patient left the hospital on January 22, 1904, the anaesthesia had greatly diminished, and there was a marked increase in the extension of the fingers and wrist and in the flexion of the elbow. The electrical reactions still showed degenerative changes, but also evidences of marked improvement. Galvanism and faradism to the nerve trunk gave sluggish contractions, as did faradism to the extensor communis. The galvanic response of the muscle was prompt and the A. C. C.>K. C. C. was still present.

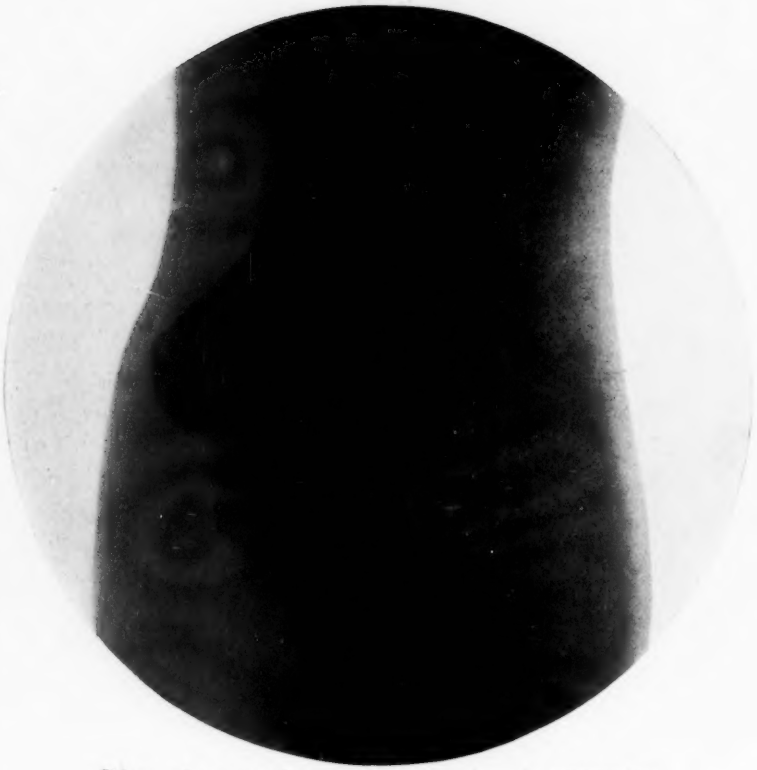
The condition of the patient continued to improve, so that at the end of the three years he was practically well. He was last seen by the writer January 18, 1908. He states that for the past

FIG. 6.



Skiagram four years after operation. Flexion. Lateral.

FIG. 7.



Skiagram four years after operation. Extension. Anteroposterior.

year the condition has been stationary and that aside from an occasional trembling of the thumb, a grating at times in the joint on turning forearm, a very slight muscular weakness of the hand, and an insignificant numbness of its back and outer side of the ball of the thumb, there are no subjective symptoms. The patient is easily able to follow his present trade of tinsmith.

EXAMINATION.—*Inspection* shows nothing but a healed linear scar in the bend of the elbow. There are no trophic changes.

Palpation.—The upper extremity of the radius gives the impression of being the normal head in proper position, rotating under the examining finger. The bowing of the ulna can be felt, but is not striking.

Motion.—Flexion at the elbow is almost perfect. Extension is slightly more than normal. Supination and pronation are unimpaired, though passive motion reveals an occasional crepitation in the superior radial joint. There is a very trifling limitation of extension at the wrist and all the movements of the fingers are perfect. The grip is strong.

Sensation.—There is slightly impaired sensation of the hand corresponding to the previous area of total anaesthesia. This is most marked on the back of the hand between the first and second metacarpals.

Electrical reactions of the nerve trunk are normal. Local stimulation of the extensor communis with the faradic current gives a somewhat sluggish response. The muscle does not appear hyperexcitable to galvanism, but A. C. C. = K. C. C.

Mensuration.—There have been no changes in the bony measurements, but the circumferences of both forearms, 5 cm. below olecranon are equal, 26 cm.

Radiographic examination shows the upper extremity of the radius rounded and slightly hypertrophied. It is not in contact with either ulna or humerus and seems to lie free in the soft parts. The fracture shows very good union. The angle resulting from the displacement has been filled in by new bone. Superiorly and laterally there is at the site of fracture an apparent hyperostosis, irregularly shaped and of moderate size. (See Figs. 6 and 7.)

Interest in the above case, and the very successful outcome of the surgical treatment, induced the writer to examine the literature of ulnar fracture combined with dislocation of the

head of the radius, particularly in reference to the mechanism, the unity, and the types of the injury, on the one hand, and to the nerve complication, on the other. This in turn led to a series of cadaver experiments which were made with the double purpose of reaching some definite conclusion concerning the former problem, in regard to which, since Malgaine's original contribution in 1854, there existed a mass of doubt and contradiction, and of studying the anatomical relations of the dislocated radial head to the musculo-spiral nerve, and the frequency with which the nerve is involved. I shall not discuss here the question of the combined bone and joint injury, for I propose publishing the results of my researches in this matter at some future date, but shall devote my entire attention now to the latter subject.

Before discussing that particular point which is of especial interest to us here, namely, musculo-spiral nerve injury as a complication of dislocations of the upper extremity of the radius associated with ulnar fracture, it is important that the following be understood: Those deductions drawn in regard to the typical injury of the nerve in cases of the characteristic combined bone and joint lesion, apply in a certain measure to isolated dislocations of the head of the radius. The difference is simply that the latter class of cases is rarer than the former and hence the neurological complication is seen more frequently with ulnar fracture. Another factor that explains the relatively greater frequency of nerve involvement in the fracture cases, is that a greater dislocation of the head of the radius is possible when the ulna is broken than when it is intact, and hence the musculo-spiral nerve or its branches are more likely to be damaged. I have purposely not considered in my discussion injury to the nerve in dislocations of both bones of the elbow. Here the traumatism to the soft parts is so extensive and diffuse, that to draw a characteristic pathologic-anatomical picture of the lesion were well nigh out of the question, though it is not unlikely that musculo-spiral injury even in these instances could occasionally be grouped with the typical cases.

RESUME OF THE LITERATURE.

The first distinct reference to the nerve complication is made by GRENIER[1] in 1878. In his thesis on fracture of the ulna, combined with dislocation of the radius, he casually notes in reporting one of his cases that the patient suffered from an extensor paralysis which yielded to electrical treatment. The forward dislocation was never reduced.

The second case is DOERFLER'S[2] (1886) of complete and permanent paralysis of the extensors in an old unreduced outward and slightly backward dislocation of the radius, with compound fracture of the ulna. He gives an utterly hopeless prognosis in cases of nerve injury.

The third report is by WINNET[3] (1894) of a four weeks' old forward and outward dislocation, with fracture of the ulna and a posterior interosseous paralysis. There are no data given as to the outcome of the nerve injury.

The fourth time that this lesion is recorded is by ANNEQUIN[4] (1898). He gives a detailed account of a case of a month-old forward and slightly outward dislocation with ulna fracture, in which the motor power of the hand was diminished, several anaesthetic zones existed on the hand and forearm, the hand was moist and cold, and the nails showed trophic disturbances. Extension of the elbow caused painful radiations along the radial branch. This is the first case in which both motor and sensory branches were involved, and both incompletely. Resection of the head of the radius brought about a complete restoration of function.

ALBERTIN[5] (1898) gives us the fifth clinical report of this injury. The patient sustained a fracture of the ulna at its middle, with a forward dislocation of the radius. A musculo-spiral palsy developed at once. The radial head was resected and the paralysis gradually disappeared.

The sixth record is SCHAEFER'S[6] (1899). In this case, due to a forward dislocation of the radius complicating an ulnar fracture, there developed an immediate complete anaesthesia of the hand with total flexor and extensor paralysis. An injury to the median, ulnar and musculo-spiral nerves was assumed, and operation fifteen weeks after the injury, consisting in freeing the nerves from their bed of scar tissue, resulted in a complete recovery seven months later.

The seventh observation is made by WILMS[7] (1903), who incidentally remarks that the musculo-spiral nerve was paralyzed in a case of forward and outward dislocation, with fracture near the middle. The case comes from the Trendelenburg clinic and a skiagram is reproduced. No details are given.

The eighth and last reported case is one of Le Dentu's, quoted by MARSAN[8] (1906). The patient sustained a fracture of both bones of the forearm and a forward dislocation of the head of the radius. A variety of trophic disturbances ensued. No distinct reference is made to the exact nerve lesions except that it is noted that there was a zone of anaesthesia in the area of the distribution of the radial, presumably due to pressure on the anterior branch of the musculo-spiral by the head of the radius. The cold, violet red hand, the "main-en-griffe," and the

anaesthesia were present at the end of three years and were apparently permanent. The head of the radius was not resected.

The case that the writer has observed is then the ninth recorded case of nerve injury in dislocation of the head of the radius complicating fracture of the ulna. He might state here that the total number of cases of the combined bone and joint injury found in the literature was one hundred and nineteen. He has found but one case of nerve injury in isolated dislocation of the head of the radius.

This is reported by CARREY[9] (1894), who states that his patient had an old forward dislocation of the head of the radius and shortly after the injury developed a musculo-spiral paralysis. There was anaesthesia, mainly on the radial side of the hand, extensor paralysis of the wrist and fingers, with marked atrophy and hyperidrosis. The head was resected on account of limitation of motion in the elbow, and fifteen months later there was a good functional result, though no direct reference is made to the restoration of nerve function.

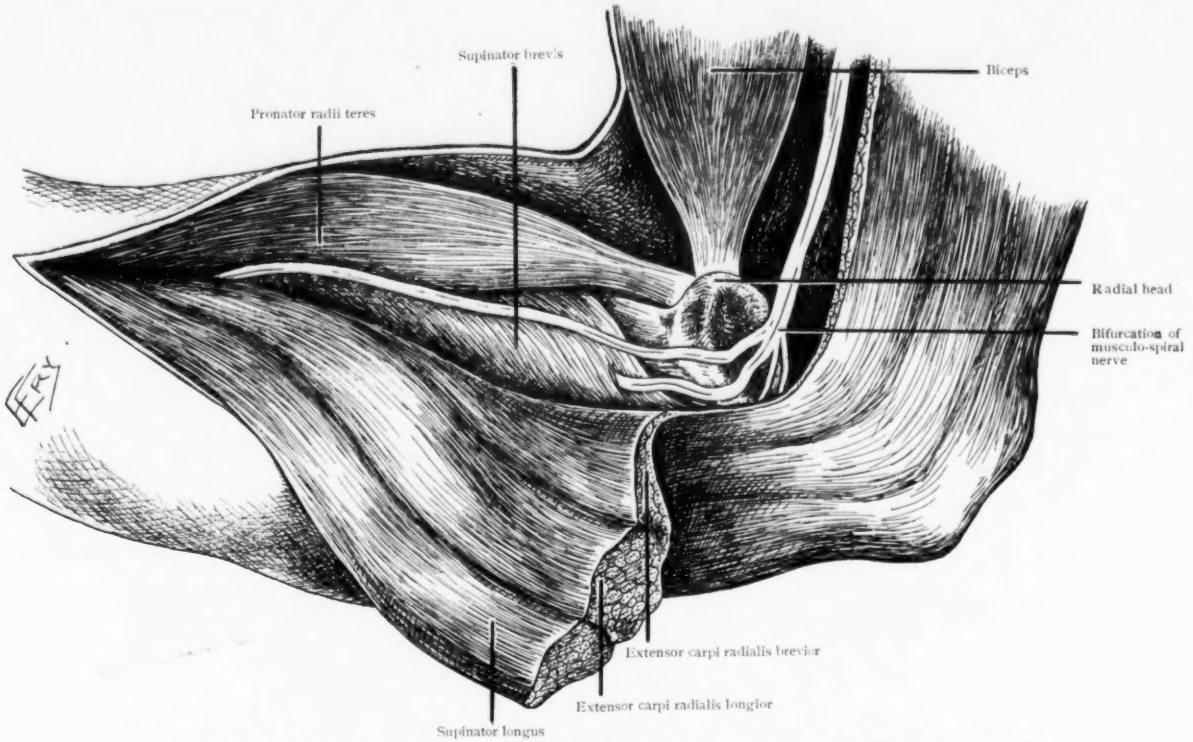
Aside from these clinical records a number of definite anatomical observations have been made, showing that the musculo-spiral nerve is in very close relation to the dislocated radial head.

SCHUELLER,[10] in 1885, first pointed out that the nerve can be stretched just at its point of division by a forward dislocation, and that the deep branch might be involved in other varieties. He demonstrated this by a cadaver experiment and published a picture of the nerve caught by the dislocated head. (See Fig. 8.) The clinical aspect is not considered.

LOEBKER,[11] the next year, substantiated this fact by a number of experiments and also represented the condition graphically. His picture shows the two divisions of the nerve around the neck of the forward dislocated radius. (See Fig. 9). He urges care in operative work on the radial head, advising a lateral incision to avoid the nerve. He admits having almost divided the nerve in one attempt to resect the head and further states that he knows of a case in which a careless operator directly severed the nerve in attempting resection. His remarks refer purely to the surgical anatomy of the situation and he entirely disregards the possible clinical picture.

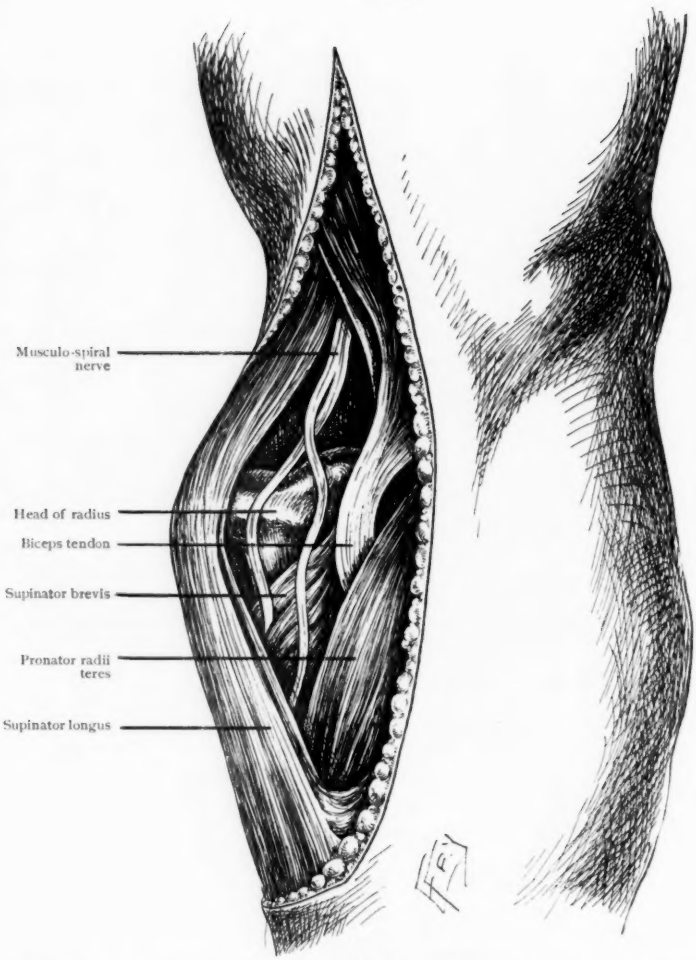
DOERFLER also calls attention to the relations of the nerve to the dislocated head, as he noted them in two of his cadaver experiments. In one forward dislocation the nerve was around the neck of the radius and in another instance of forward and outward dislocation it was stretched over the head just at the point of division. In both cases exaggeration of the dislocation—hypertension—would have torn the nerve.

FIG 8.



Relation of the musculo-spiral nerve to the forward dislocated radial head (after Schueller). Left arm.

FIG. 9



Musculo-spiral nerve around the forward dislocated head of the radius (after Lœbker). Right arm. This sketch shows anatomical relations almost identical with those found at operation in the case herein reported.

ANNEQUIN noted in his case that the radial head had lifted up the musculo-spiral nerve and ALBERTIN made a similar observation at the operation on his patient. SCHAEFER also saw this condition though he did not resect, but simply loosened the nerve from the surrounding fibrous tissue.

In spite of these very positive anatomical observations and the fair number of reported cases, musculo-spiral involvement in radial head dislocation with or without fracture of the ulna has been very generally ignored by the medical teachers.

The older general surgeries make no reference to the subject whatsoever. Rieffel in Le Dentu and Delbet's "Traité de chirurgie" (1896) calls attention to Grenier's case, and Wilms in the 1907 edition of the "Handbuch der praktischen Chirurgie" mentions the lesion in connection with his case quoted above. The latter, however, in his chapter on injuries of the nerves at the elbow and in the forearm totally disregards the question, though he does speak of fracture of the radial head as a cause of the nerve injury. Tillmanns (1898) simply notes the possibility of the nerves being injured in complicated elbow dislocations, while Koenig (1900), though he devotes a separate chapter to injury of the soft parts at the elbow, does not so much as mention the typical lesion. Neither of the two most recent American systems on general surgery (1907) Keen's, and Bryant and Buck's make the slightest reference to musculo-spiral paralysis in elbow dislocations.

Bardenheuer, in his "Verletzungen der oberen Extremitaeten" (1888), remarks that the deep branch may be compressed in forward dislocations of the capitulum radii, and in his "Allgemeine Lehre von den Frakturen und Luxationen" (1907), he merely casually repeats this statement.

Of the special text-books on fractures and dislocations that I have consulted, the older ones, Hamilton (1891) included, contain no allusion to the nerve injury. Stimson (1907), in his chapter on fracture of the ulna with dislocation of the radius, mentions Doerfler's case and notes the possibility of the complication, but under the special heading of nerve injury due to dislocations, he absolutely overlooks the ques-

tion. Helferich, in his "Frakturen and Luxationen" (1906), speaks of musculo-spiral paralysis as a possible complication of anterior dislocations of the upper extremity of the radius, as do Hoffa in his "Lehrbuch" (1904) and Hennequin and Loewy in their "Fractures des os longs" (1904), though none appears to appreciate the fact that the injury is a typical one or to lay any stress upon it. The last two, even, in their latest publication, "Les luxations des grandes articulations" (1908) do not consider the nerve lesion sufficiently important to mention at all.

Stanciulescu, in his dissertation on dislocations of the radius complicating fracture of the ulna (1890), notes that several cases of rupture of the anterior branch of the musculo-spiral have been recorded as due to radial dislocation, and Pascal, in his inaugural thesis on isolated dislocations of the head of the radius (1907), merely refers to musculo-spiral paralysis in passing. Zieger in his monograph on traumatic dislocations of the radial head (1901) makes a very casual reference to the possible nerve complication.

The text-books and systems on general medicine completely disregard the lesion, and the neurological works treat the subject in about the same manner. Gowers (1895), Dana (1904), Church and Peterson (1905), Oppenheim (1905), and Starr (1907) absolutely ignore radial dislocation as a possible cause of musculo-spiral paralysis, though every other conceivable etiological factor is noted. Grasset and Rauzier (1894) do speak of elbow dislocation as a cause of nerve lesion, but do not specify.

In their monographs on injury of nerves, Weir Mitchell (1872) and Bowlby (1889) both devote a special chapter to injuries due to dislocations, but our particular type is totally neglected. Pearce Bailey's volume of "Diseases of the Nervous System Resulting from Accident and Injury" (1906), likewise contains no allusion to it. Schede and Graff in their article on the surgery of the peripheral nerves in Penzoldt and Stintzing's "Handbuch" (1903) totally disregard dislocation of the radius in the etiology of musculo-spiral

palsy. Bernhardt, in his "Erkrankungen der peripherischen Nerven" (1902), remarks that fracture of the head of the radius can cause nerve injury, but no word on dislocation. He is no more explicit in the volume on nervous diseases of the "Deutsche Klinik" (1906). Chapoy (1874), Biberfeld (1893), and Potain (1896), writing on the special subject of musculo-spiral paralysis, are apparently unaware of the danger of traumatism to the nerve from the dislocated head.

Summarizing the situation it is seen that, while a moderate number of cases have been put on record and several investigators have noted distinctly the anatomical connection between the musculo-spiral nerve and the dislocated head of the radius, the fact that this nerve lesion is a typical and characteristic one, has been entirely overlooked. In fact, the very possibility of the injury is only admitted by an occasional author on general surgery, and perhaps somewhat more frequently by those dealing more specifically with dislocations, though in neither instance is any importance attached to the matter nor its significance appreciated. Absolutely no reference is found to this type of nerve injury among the general medical and neurological writers, be it among those dealing with nervous diseases in general, with nerve injuries in particular, or even with musculo-spiral paralysis exclusively.

Of course, the general disregard of this subject by the medical writers is explainable by the rarity, first of radial dislocation, and secondarily of the nerve complication, but the significance and importance of the latter and its comparative frequency in cases of the joint injury have justified the writer in performing the following cadaver experiments to determine the relations of the nerve to the dislocated head and the regularity of the involvement. As he was also interested in the mechanism of the combination of radial dislocation with ulnar fracture he always produced this type of injury. Further, this is the easiest way of causing a dislocation of the radial head, and finally this was the type of radial dislocation which represented the vast majority of the clinical observations quoted

above and thus the conditions during life were most closely imitated.

EXPERIMENTS.*

EXPERIMENT I.—January 6, 1908. German Hospital. Left arm of medium-sized, middle-aged, female body. Ulna partly sawed through at upper third and forearm bent back over edge of block. Fracture, with forward dislocation of head of radius.

Dissection.—After separating the fibres of the supinator longus, both branches of the musculo-spiral nerve, about 2.5 cm. below the bifurcation, are found twisted around the neck of the radius and pushed slightly outward by the head. On reduction of the head the nerve slips off, but on redislocating so that the dislocation is slightly more outward, the two branches are directly lifted up by the head. If the dislocation be exaggerated, the nerves are dangerously stretched and they could even be lacerated by continuing the hyperextension. Flexion of the elbow relaxes the tension on the nerves. A tight bandage, with the dislocation unreduced, would severely crush the nerve against the radial head. On reducing and redislocating further inward the nerves escape.

EXPERIMENT II.—Right arm of same body. Fracture and dislocation produced as above, but in such a manner that the dislocation is somewhat more outward.

Dissection.—Separating the fibres of the supinator longus one strikes the two divisions of the musculo-spiral a short distance below the bifurcation stretched over the radial head like violin strings over a bridge. Hyperextending the forearm would tear the nerves. Flexion relaxes them. Simple forward dislocation catches only the radial branch, while more direct outward displacement catches only the posterior interosseous.

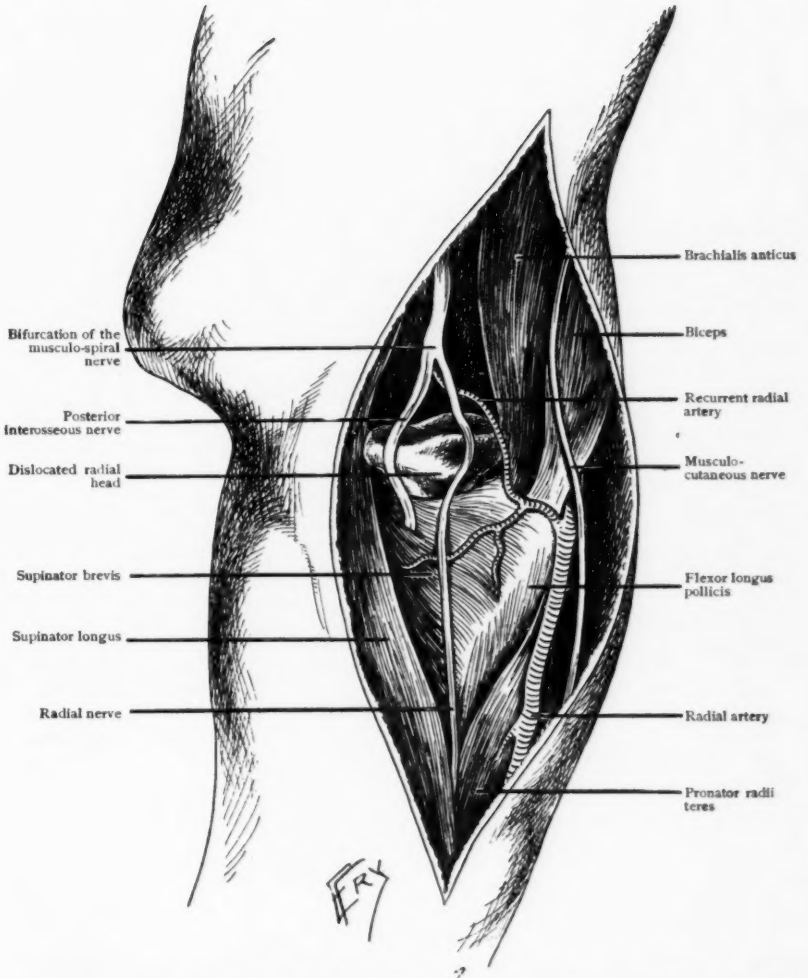
EXPERIMENT III.—January 20, 1908. Cornell University. Left arm, exarticulated at shoulder of frail, elderly, female cadaver. Colles' fracture and fracture at middle of ulna produced by blow on palm and anterior dislocation of head of radius caused by simple hyperextension and supination.

Dissection.—Separating the supinator longus one sees the two branches of the musculo-spiral lying to the outer side of the head. The radial is in direct contact with the bone. There is a fracture of the radial head. If the dislocation be made a trifle more outward both branches are caught on the head and are stretched by exaggerating the dislocation. An attempt to rupture nerve by hyperextension is unsuccessful owing to the fact that the upper part of the nerve is not fixed. Even exposure of the trunk of the musculo-spiral in the upper arm and holding this, does not permit of rupturing. The nerve slips through the fingers. It is very tough and elastic, due probably to injecting fluids that have been used to preserve the body.

EXPERIMENT IV.—Right arm of same cadaver, also disarticulated from

* Most of these experiments were performed at the anatomical laboratory of Cornell University through the courtesy of Dr. I. S. Haynes.

FIG. 10.



Sketch of condition found in Experiment IV. A similar state of affairs was found in Experiment II. This is a typical relation of the two divisions of the musculo-spiral nerve to the forward dislocated head of the radius.

shoulder. Compound fracture through base of olecranon, with forward and slightly outward dislocation of the head of the radius produced by blow of heavy mallet.

Dissection.—Shows the two branches of the nerve slightly stretched over the head of the radius as in Experiment II. The tension is increased by further extending the forearm and relaxed by flexion. (See Fig. 10).

EXPERIMENT V.—February 7, 1908. Cornell University. Right arm, fair-sized, elderly male cadaver. Fracture of ulna above styloid process and later at lower third. Hyperextension produced typical backward dislocation of both bones of the elbow, but incomplete.

Dissection.—Retracting the supinator longus, one sees both branches of the musculo-spiral relaxed and some distance away from the bone. This is particularly true of the radial, which could not possibly be injured in this dislocation. The posterior interosseous might be caught if the dislocation were more outward, but it is difficult to conceive how a simple backward dislocation could injure the nerve which simply relaxes and slips from the neck of the bone. In extreme dislocations backward it is possible that it might be stretched.

EXPERIMENT VI.—February 25, 1908. Cornell University. Left arm of cadaver used in previous experiment. Forward dislocation of the head of the radius, produced by hyperextension of the forearm after base of olecranon had been fractured by sharp blow of mallet.

Dissection.—The upper extremity of the radius has lifted up and stretched the radial nerve, while the posterior interosseous has entirely escaped. If the dislocation be reduced and the head of the radius be redislocated slightly more outward, both branches are caught. The nerve slips from the bone in an attempt to rupture by increasing the extent of the dislocation. If the radius after having been dislocated forwards, be pushed upwards about 2 cm., the main trunk of the musculo-spiral is impinged upon by the head of the bone.

Before drawing any further inferences from the above experiments, I shall now briefly discuss the

SURGICAL ANATOMY OF THE MUSCULO-SPIRAL NERVE AT THE ELBOW JOINT.

Piercing from behind forwards the lateral intermuscular septum above the lateral condyle, the musculo-spiral nerve quits its groove on the humerus, and descending between the brachialis anticus and supinator longus muscles it divides into two branches, the radial and posterior interosseous nerves, just above and in front of the eminentia capitata of the lateral condyle. Just above the point of division are given off mus-

cular branches to the supinator longus, extensor carpi radialis longior and usually to the outer part of the brachialis anticus.

The radial nerve or superficial branch is slightly smaller, is situated medially, and is a purely sensory nerve. It passes over the humero-radial joint and then down along the radial side of the front of the forearm. It is covered by the supinator longus and is gradually approached on its medial side by the radial artery which meets it at about the middle of the forearm.

The posterior interosseous nerve or deep branch is the larger of the two divisions, lies external and posterior to the radial and is in the main a motor nerve. It passes over the humero-radial joint obliquely outward and downward, and just below the head of the radius it pierces the supinator brevis which presents a C-shaped opening for its reception. It passes between the two layers of this muscle, winds in a half spiral turn laterally around the upper part of the shaft of the radius and emerges posteriorly 6–8 cm. below the external epicondyle, lying between the extensor communis and the extensors of the thumb.

The point of division of the musculo-spiral and the two branches for several centimeters below it are then in direct relation to the humero-radial joint, only separated from the bone by the anterior and orbicular ligaments. The nerves are comparatively fixed in their position, and very slightly movable, hence liable to injury. The nerves are held in place in the fascia of the supinator longus, which, if lifted up, takes the nerves with it.

The superficial branch or radial supplies the integument of the radial side of the ball of the thumb, the greater part of the dorsum of the hand, the thumb, index, middle and radial half of the ring finger. It anastomoses with the musculo-cutaneous and ulnar nerves.

The deep branch or posterior interosseous supplies the following muscles,—extensor carpi radialis brevior, supinator brevis, extensor communis digitorum, extensor minimi digiti, extensores pollicis (longus et brevis), extensor indicis and ex-

tensor ossis metacarpi pollicis. A sensory terminal branch is distributed to the wrist joint.

CLINICAL SUMMARY.

Pathogenesis and Pathology.—In view of the anatomical conditions it is easily understood that in nearly every dislocation of the head of the radius the integrity of the two branches of the musculo-spiral is threatened. This is especially true of anterior dislocations. In this type, the upper extremity of the bone is likely to directly inpinge upon the two branches of the nerve, and this occurs almost invariably just below the bifurcation. As a result of the analysis of the reported cases and the experimental investigations I believe we are justified in assuming that:—

a. In forward and slightly outward dislocation one or both branches are most likely to be caught. Five out of nine of the cases with ulnar fracture demonstrated this.

b. In forward and inward dislocation, the nerves usually escape involvement.

c. In forward dislocation, the radial alone may be injured while the posterior interosseous may escape.

d. In outward dislocation the posterior interosseous alone may be involved and the radial may be free.

e. In backward dislocation, neither nerve is liable to be injured. It is almost out of the question that the sensory branch be affected in this type, but in extreme cases the deep branch might be stretched.

f. In forward dislocations where there is a marked displacement upwards the head of the bone might strike the main trunk of the nerve.

When the dislocation is a complication of fracture of the ulna, the nerve is much more likely to be affected, as the displacement of the radius is usually much greater under these conditions. While the literature of simple dislocation has not been reviewed by me as exhaustively as that of the combined fracture and dislocation, I have examined the large majority of the special papers on the former subject and have found

but one case of nerve injury, while in the latter class I have found nine instances. Although there is great probability that even in simple dislocations the nerve injury is more frequent than the one case found would indicate, the proportion of one to nine is significant.

As to the exact nature of the nerve injury, this is usually a direct contusion by the protruding bone or an actual laceration, complete or partial, followed by the usual degenerative changes. In the operated cases, the nerves were never found completely torn across,—though in my case the nerve fibres seemed completely divided and the nerve ends were held together merely by fibrous strands, the remains of the sheaths.

The nerves are usually stretched directly over the radial head, and hyperextension, which exaggerates the dislocation, tends to increase the tension of the nerve, and likewise the injury. One or both nerves may be pushed medially or laterally, or the head may emerge between the two branches producing an injury in this position.

It is conceivable that under certain conditions the nerves might simply be stretched without coming in contact with the bones, and thus sustain, from the pull, a partial or complete rupture. This would be the mechanism in posterior interosseous paralysis due to posterior dislocations. The nerve injury usually takes place directly at the time of the joint lesion.

The frequency of this nerve complication is comparatively great as statistics of its incidence in cases of the double bone and joint lesion indicate. In the one hundred and nineteen cases of fracture of the ulna associated with dislocation of the upper extremity of the radius, which I have succeeded in collecting from the literature, the nerve was injured in nine cases, or 7.56 per cent.

Symptomatology and Diagnosis.—The symptoms are very much the same as the classical ones of musculo-spiral palsy added to the usual ones of fracture and dislocation or dislocation alone. They may be complete or incomplete in their distribution or their degree, depending upon whether one or both

branches are involved and to what extent. As the main trunk of the nerve appears never to be injured, except in decided upward displacements, there may be only sensory or only motor symptoms, if only the radial or only the posterior interosseous be caught—or if both branches are damaged the symptoms will be mixed. Of the ten reported cases four were mixed, three were purely motor and one was apparently a purely sensory paralysis. In two the nature of the paralysis was not specified.

The usual anaesthesias in the area of the radial distribution, the extensor paralysis, and the trophic disturbances are too well known to detail here. These are regularly present and are partial or complete according to whether the nerve conduction be completely or only partially destroyed.

One characteristic and significant fact is that the supinator longus is not likely to be paralyzed, as its branch is given off just above the bifurcation.

The nerve symptoms usually develop promptly after the injury. The diagnosis of the lesion is self-evident.

Prognosis and Treatment.—The prognosis of this form of musculo-spiral paralysis is good, notwithstanding Doerfler's opinion to the contrary. In only two of the ten cases is it definitely stated that the paralysis was permanent. Six were positively cured, and in two the final result is not indicated. The ultimate restoration of function is of course best if the correct treatment be applied as soon after the injury as possible.

Treatment consists primarily in freeing the injured nerve and this, fortunately, generally corresponds to the regular treatment for the dislocation itself.

1. If possible, *i.e.,* if the injury is recent, a bloodless reduction might be attempted. This can be accomplished by extension, traction, and then flexion. Pressure on the head of the radius advocated by some authors should be avoided for fear of further damaging the nerve—as also hyperextension. After reduction, the arm can be put in plaster, in semi-flexion midway between pronation and supination. The ulnar frac-

ture simply requires the usual reduction of the deformity and anterior and posterior splints or a plaster dressing.

2. If the attempt at simple reduction is not successful and the ulna fragments are still ununited, an arthrotomy with reduction of the radial head and suture of the capsule tear, as advocated by Sprengel [12] in isolated dislocation, might be tried. However, this procedure will only be of service in very specially selected cases in which there has been no too great disturbance of the adjacent tissues. Further, if the articular surfaces have been destroyed, if the head is hypertrophied, and especially if the ulna fragments have united with shortening of the bone, arthrotomy is of little use.

Osteoclasis of the ulna, proposed by Doerfler, may be of service if the deformity of this bone is very great, but simply to lengthen the ulna in order to render arthrotomy possible, does not justify refracture.

3. Resection of the head of the radius, first suggested by Loebker [13] and later advocated by numerous other surgeons in old dislocations of the head of the radius, is unquestionably the operation of choice in the majority of older cases, where reduction is not possible by the bloodless method. This accomplishes the double purpose of relieving the nerve and of restoring the impaired elbow function in the simplest manner possible. The lateral incision of Hueter [14] should be used to avoid further damage to the nerve, and the most practical way of removing the head is with a Gigli saw. Four of the ten cases collected were cured by resection.

4. Suture of the nerve by one of the approved methods must of course be performed should it be found ruptured at the time of operation. Yet, if the remains of the nerve sheath hold the ends of the torn nerve together, it is scarcely necessary to sew the nerve, as my case demonstrates. If, after simple reduction there be no improvement within three months, the nerves must be exposed, as rupture or scars are probably responsible for the non-improvement and must be treated.

5. Electricity, massage, active and passive motion, and

stimulating medication should be used as adjuvants of the surgical treatment.

6. Prophylactically the following might be emphasized: In all cases of dislocation of the head of the radius in which the nerve is not involved, the fact that the nerve is in close relation to the dislocated head must be borne in mind and care must be exercised not to produce a nerve lesion by rough or careless manipulation, particularly in the sense of hyperextension or direct digital pressure on the head of the bone. The known proximity of the nerve to the radial head should in itself constitute a definite indication for reduction, for even if there is no primary paralysis a pressure paralysis may develop secondarily, if the dislocation remain unreduced. One should likewise avoid applying a tight bandage before the dislocation has been reduced, as the nerve might easily be compressed against the bone. Further, in all operations on the dislocated radial head the position of the nerve must be remembered, so that is is not injured by careless operative technique.

CONCLUSIONS.

1. Musculo-spiral paralysis as a result of dislocation of the head of the radius is a distinct type of nerve injury, and is quite as definite and characteristic as any other form of injury to this nerve. In fact, in every case of anterior dislocation of the head of the radius the two divisions of the musculospiral nerve are in danger and it is a fortunate accident if they escape.

2. Its actual occurrence is naturally rare, but comparatively, *i.e.*, compared to the frequency of the joint injury itself, it is not infrequent.

3. It is most likely to occur when the dislocation accompanies ulnar fracture and when the direction of the dislocation is forward and slightly outward.

4. The nerve is almost invariably injured below its point of division into the posterior interosseous and radial. One or both branches may be caught by the dislocated head.

5. The symptoms are practically those of the typical

musculo-spiral palsy. They may vary greatly in extent or degree, depending upon whether one or both nerves be injured and how badly. The supinator longus muscle escapes involvement.

6. The prognosis is good under appropriate treatment, which is practically the same as that for the dislocation: simple reduction, if possible, and generally resection of the head of the radius in old cases, with nerve suture if necessary.

7. Should the nerve be uninjured in a dislocation of the radial head, its close proximity to the bone should be borne in mind, the dislocation should be reduced, and care should be exercised not to injure the nerve, by pressure, hyperextension or careless operative technique.

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ADDENDA.

After this paper was finished, a publication by Sherren[1] appeared on injuries of nerves to which I refer here for the sake of completeness. He states that he has seen one case of musculo-spiral paralysis due to forward dislocation of the head of the radius and that Borchard has also observed the condition once. I have searched for the latter's report in vain. Sherren gives no particulars of the two cases, not even mentioning whether or not there existed a fracture of the ulna. He simply made the general statement that posterior interosseous paralysis, especially, may be a complication of dislocation and fracture of the upper extremity of the radius.

[1] Sherren, J. Injuries of Nerves and Their Treatment, London, 1908, p. 233.

CONGENITAL DEFECT IN THE ULNA.*

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THE condition of congenital absence of the ulna is one of the rarest anomalies to which the skeleton is liable. My patient also presented the extremely interesting feature of there being associated with it a true hyperplasia of bone in other portions of the body. A few of the numerous exostoses, from which she also suffered, are clearly shown in the accompanying X-ray photographs.

She first presented herself to me for treatment about two years ago, at the dispensary of the Howard Hospital, for what she believed was a dislocation of the right wrist, as the result of a traumatism and at that time I elicited the following history: M. D., aged 16 years, white, and by occupation an actress.

Family History.—Father living and well. Mother living but bed-ridden with "dropsy"; three brothers and three sisters living and well; four brothers and three sisters dead, two of diphtheria, one of meningitis and the others in infancy. Has no knowledge of any tuberculosis, malignant disease or syphilis in the family. No other member, immediate nor remote, of her family has suffered from any deformities.

Previous History.—Had diphtheria, scarlet fever, measles, chicken pox and typhoid fever two years ago, from all of which diseases she made a good recovery. Six months ago she noticed that exostoses were appearing, especially about the knees and ankles and the arms. Since that time they have steadily increased in size, and give constant pain which is increased by motion and pressure. She states that a "lump" appears whenever she receives a traumatism.

History of Present Condition.—Was playing with her sister who caught her by the right hand and gave it a violent pull,

* Read before the Philadelphia County Medical Society, February 26, 1908.

FIG. 1.

Absence of lower end of right ulna.

FIG. 2

Right forearm

Left forearm.

Congenital defect in ulna. Multiple exostoses.

which was at once followed by a marked deformity and complete loss of motion of the wrist joint. An attempt was made to make an examination without an anesthetic but the patient was very hysterical, so ether was given and the wrist joint was found not only freely movable in all directions, but the absence of the lower end of the ulna could be clearly felt. Further examination showed the presence of numerous exostoses. They are very marked on the upper end of the right humerus and on the left radius. The right wrist was dressed with a solution of lead water and alcohol and then put at rest upon a splint. X-ray photographs (see Fig. 1) were taken later that day and they show not only the absence of a portion of the ulna but also the exostoses on some of the other bones. Under rest the inflammation rapidly disappeared from the wrist joint and the patient soon had as good use of this arm as she had prior to the accident. I urged operation upon the exostoses, but the patient declined it, and I lost sight of her until she was admitted a year later to the Philadelphia Hospital, in the service of Dr. J. Chalmers Da Costa, and on June 13, 1906, his assistant Dr. Schwartz removed a number of the exostoses from the upper part of the tibia on both sides and from the external condyle of the femur on the right side. These were found to be very hard and attached firmly to the shaft of the bones. The patient made an uninterrupted recovery, and was eventually discharged from the hospital proper to the "Out Wards." She was readmitted to the surgical ward of the hospital in March, 1907, and on the 19th of that month she had the exostoses removed from the lower limbs. Two from the right knee, one from the outside and one from the inside. One from the outside of the left knee, the only one which was not firmly adherent to the femur. One also was removed from the lower end of the right fibula. The patient again made a good recovery and returned to the out wards. She has been there ever since except when admitted to the hospital, once for a gynecological operation and again for operation for appendicitis, both of which were successful.

Congenital absence of the ulna is a very rare condition; after a careful search of the literature I have been able to find but eight other reported cases. Förster, in his classical monograph, "Missbildungen d. Menschen," does not even mention

this anomaly, although he notes the frequent absence of the radius. The cases that have been previously reported are briefly the following:

1. GOLLER (quoted by A. Schnelle, "Inaugural Dissertation," Gottingen, 1875), in 1698, described a seven months' old foetus, in which both ulna with four fingers were absent, only the radii and both thumbs being present, and in the lower extremities only the tibia and great toes were present.

2. SENFTLEBEN (Virchow's Archiv., xlv, 1869, p. 303) notes the case of a recruit, aged 21 years, in whose left ulna there was a defect occupying the middle third of the bone. This defect measured two and one-half inches, and where the bone was absent a ligamentous band could be felt. The patient was in every other way normal.

3. ROBERTS (Trans. Path. Soc., Philadelphia, xiii, 1885, p. 4) reports the case of a man, 73 years old, whose right ulna was absent along with the third, fourth and fifth digits and their metacarpal bones. The pisiform, cuneiform and unciform bones were absent from the wrist. On the left side the ulna was present, but the third and fourth digits and the third metacarpal bone were wanting. The patient stated that his sister had one hand deformed like his and that she was the mother of a perfectly formed child. Another sister's child had a hand deformed like his right hand. The patient further stated that he had seven children, of whom three had malformations similar to his.

4. PRINGLE (Jour. of Anat. and Physiol., xxviii, 1893, p. 239) states that he had under observation, a man, aged 31 years, in whom both ulna were absent. There was no family history of deformities. The mother stated that the patient was born at full term, but during the early months of pregnancy she had received a severe fright. Right arm: The hand is provided with three fingers only, one well developed, which appears to be the middle finger, and two malformed ones, one to each side of the former. The wrist joint is freely movable, the trapezium is absent, but it is not possible to determine if any other carpal bones are wanting. There is no trace of the ulna. Left arm: The hand is narrower and less well shaped than the right; it also is provided with only three digits, the best developed of which seems to be the index. The wrist joint is freely movable, and the left trapezium is present. There is no trace of the ulna.

5. LANE (Trans. Clin. Soc., London, xxxii, 1898–9, p. 44) reports the case of a girl, 3 years of age, whose ulna consisted of two separate parts, whose pointed extremities slightly overlapped and whose axes varied considerably in direction. The lower end of the ulna was situated considerably above the level of the extremity of the radius. No evidence of any other deformity. It is interesting to note that this deformity was successfully corrected by the wiring in of the femur of a rabbit.

6. YUDT (Vrach. Gaz., S. Peterb., x, 1903, p. 342) notes the case of a woman, aged 62 years, who presented herself for treatment for a

fracture of the neck of the left humerus and in whom the right ulna was almost entirely absent. It consisted of a piece of bone, 7.5 c.m. long, extending downward from the elbow. The radius was arch-like in shape and somewhat thickened below where it articulated with the carpus; its upper extremity was dislocated forward and outward. The right hand was smaller than the left but all its bones were present. The only other deformity was an absence of the right pronator quadratus muscle. All the normal movements of the fore arm were well preserved except flexion of the elbow, which was much limited for purely mechanical reasons.

7. KACKKACHEFF (Russk. Gaz. S. Peterb., iii, 1904, p. 325) reports the case of a man, 24 years of age, in whom the left ulna was entirely absent. Pronation was well preserved. There was no other deformity.

8. AGAYEFF (Vrach. Gaz. S. Peterb., xii, 1905, p. 155) notes the case of a man, 40 years, who gave a history of polydactylism in his mother, who had it in one of her feet, and in an uncle, on his father's side, who had it in both feet. The patient had had four children and all were perfectly formed. Right arm: The only deformity was polydactylism of the little finger. Left arm: This arm was flexed at the elbow and in incomplete pronation. The hand had but three fingers, the thumb, index and middle. A rudiment of the little finger was also present. The humerus was normal and in the trochlear region was a round bony prominence, of the shape of the patella, movable in all directions and attached to the tendon of the triceps muscle. The ulna was completely absent, except for this rudiment. The little finger and the fourth and fifth metacarpal bones were absent, as was also the unciform and os magnum. The movements of this hand were somewhat limited, chiefly for mechanical reasons. No evidence of any other deformity.

The literature of multiple exostoses is indeed a voluminous one. I have gone through it with care and been able to find only one case where the hyperplasia of bone was associated with a congenital osseous defect. Battle (Trans. Clin. Soc., London, xxxix, 1905–6, p. 252) reports the case of a girl, 13 years of age, who had osteomata on nearly all the long bones, near their terminal epiphyses. The right ulna measured only six and one-half inches, while the left measured nine inches. The bone was well formed, only it was shorter than the radius, which had its shaft bowed outward and the head of the bone was displaced forward and outward.

THE SURGICAL TREATMENT OF BUNION.

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THE discomfort suffered by patients afflicted with bunions is so far in excess of the apparent simplicity of the malady that the disease has come to be a subject well worthy of consideration from a surgical point of view. The condition is usually associated with hallux valgus and is attributed to various causes; the principal one being the wearing of pointed, short and tight shoes. Arthritis and gout may be contributing factors in some cases. From the examination of many patients with this trouble, it appears that the peculiar shape of some feet renders them liable to this deformity. The primitive foot was probably used for grasping objects, the great toe being situated farther back, somewhat like, but less marked than the thumb on the hand, and as is now seen in some of the lower animals.

Confinement of the foot incident to civilization, has possibly tended to the advanced position of the great toe, though many feet still present the short great toe with the wide foot in which the second and often the middle toe is the longer. Such feet rarely have the deformity "hallux valgus," although some slight bunion may be present, and this regardless of the kind of shoe worn.

The characteristic of the foot with tendency to bunion is, that the great toe when straight is from one-fourth to one-half inch longer than the second toe. This type of foot may remain a perfect foot through life but should it become confined in a pointed-toe, narrow, and especially a short shoe, the leverage action against the inner side of the great toe develops hallux valgus with true bony growth on the inner side of the head of the metatarsal bone which becomes covered by a bursal layer. This area becomes most painful to pressure and is liable to special attacks of inflammation. The tendon of the

FIG. 1.

Hallux valgus deformity as shown by photograph.

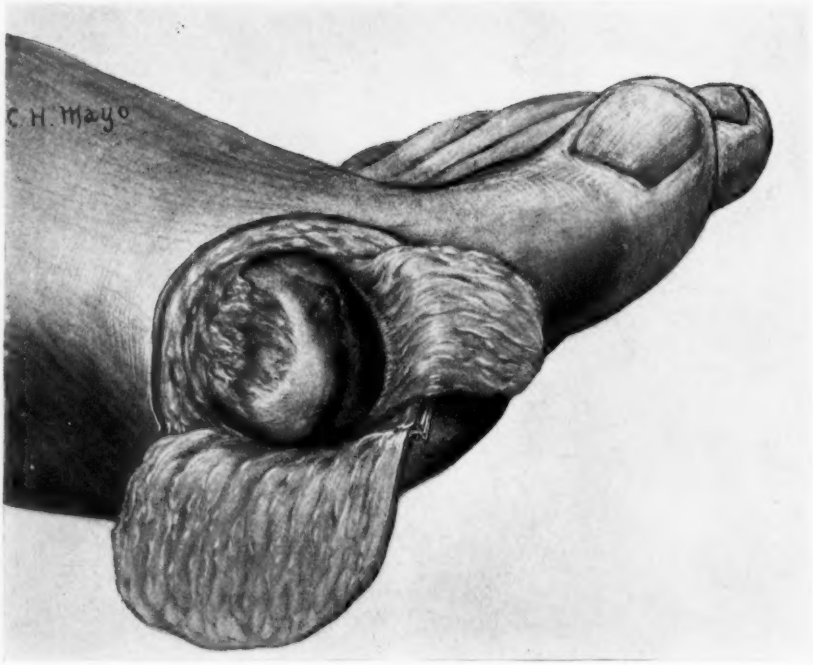
FIG. 2.

Deformity as shown by radiograph

FIG. 3.

Radiograph of result after nine months

FIG. 4.

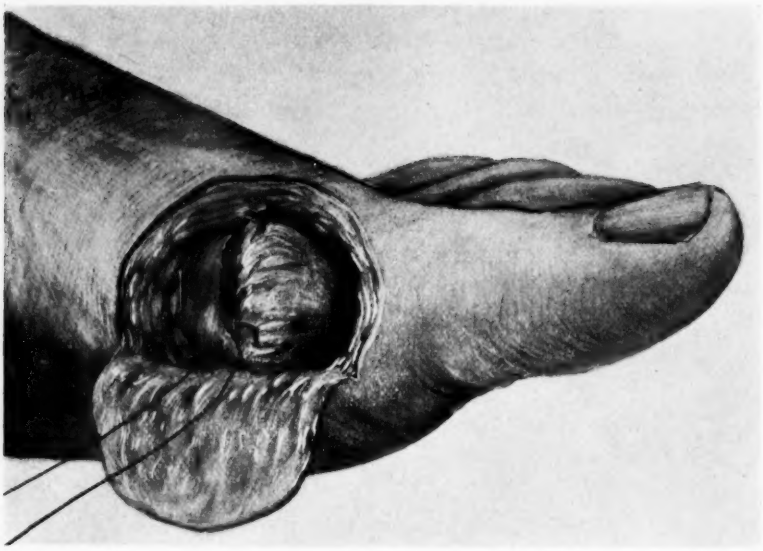


Showing bony deformity

FIG. 5.

Bone section ready for insertion of bursa.

FIG 6



Suturing of bursa to develop joint.

extensor proprius pollicis becomes displaced to the outer side of the joint area, and with the angulation of the toe its sheath becomes a pulley which soon gives way to tension, after which the tendon acts to still further increase the deformity.

Many patients have the trouble in so slight a degree that proper shoe-fitting will relieve them. Some secure comfort by wearing special appliances for supporting the toe or protecting the bunion.

Several operations are recommended for the cure of hallux valgus. Resection of the metatarsophalangeal joint is often practiced; also a wedge-shaped or simple osteotomy of the metatarsal bone, which will relieve some cases but does not narrow the foot or remove the bunion, if it is present.

It is also recommended by some operators, to remove the head of the metatarsal, and, to avoid the scar about the inner side of the joint, their incision is made between the first and second toes.

For a number of years we have practiced the following method in operating upon patients afflicted with this trouble and the regularity of its success leads us to present the technic of the method.

Operation.—A curved incision is made base down over the inner side of the metatarsophalangeal joint, the skin being lifted in the flap which is separated from the bursa. A curved incision " horse-shoe " is now made around the bursa with its base forward left attached to the base of the first phalanx, its inner surface being synovial membrane and continuous with the anterior surface of the joint.

The head of the metatarsal bone is then removed with heavy forceps, the section also removing two-thirds of the anterior portion of the bony hypertrophy on the inner side. The remainder of this projecting bone is cut away to the level of the shaft of the metatarsal. The cut end of the metatarsal bone is now rendered as smooth as possible by rongeur forceps and the bursal flap turned in to the joint area in front of the bone, where it is held in place by one or two catgut sutures. We thus utilize an already formed bursa to secure and main-

tain a movable joint which works in a movable splint,—the shoe,—and thereby secure an immediate result, which is obtained with difficulty in other joints by transplanting fatty tissue into the joint area to prevent bony union; an operation made familiar by the efforts of Dr. J. B. Murphy, who has demonstrated its great value in certain cases where the joints have become fixed by injury, disease, or operation. But in these cases, there being no natural fixed support like the shoe, it is necessary to use apparatus to limit and direct the motion. In some cases the tendon and sheath of the extensor proprius pollicis is best displaced by suture to the inner side of the mid-line of the toe.

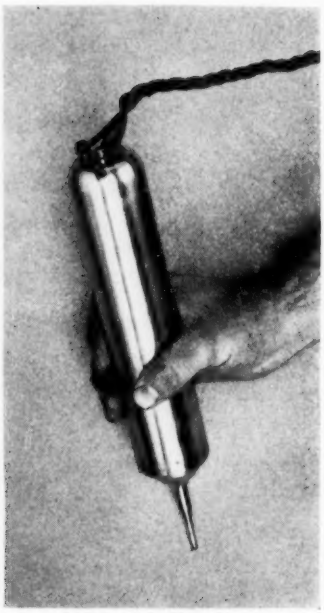
Provision is made for drainage by a punctured incision in the base of the skin flap in which is inserted a doubled catgut strand. The skin incision is now sutured in place with horse-hair or catgut. The dressing is a pad of gauze wet in 70 per cent. alcohol, placed between the great and second toes. The anterior portion of the foot is covered with a dressing which is moistened with the same solution at intervals during the first few days.

With ordinary care in protecting the wound these patients are often much better able to go about within two weeks than they were before the operation. It frequently occurs that they are not even kept in the hospital during convalescence.

The motion becomes nearly perfect. The great toe is shortened to a reasonable degree, somewhat narrowing the foot at its widest line; a factor of importance in the prevention of recurrence. The bearing surface for support is excellent as the under side of the joint floor is not disturbed, and the cushion beneath with its sesamoid bones is left intact.

Theoretically it could be said, that the scar is badly placed and would be subject to pressure from the shoe. Practically this is not true, as we have found from operating upon 65 cases during the past eight years according to this method.

FIG. 1.



Motor held in hand ready to operate.

A NEW MOTOR FOR BONE SURGERY.*

BY W. SOHIER BRYANT, M.D.,

OF NEW YORK.

DESCRIPTION of motor: 3/10 horse-power; 3 phrase; 10 volts; 15,000 revolutions per minute; 185 cycles; 2 poles; diameter, 2⅛ inches; length of barrel, 9½ inches; weight, 7 lbs. 5 ozs.

This motor is unique in as much as it is the first practical application of well known electrical principles in such a way as to combine three-tenths horse-power with a weight of only seven pounds, about one-eighth that of the ordinary motor of equal power. Because of its light weight it fills the requirements better than any other motor for use in the flying machine where weight is the chief difficulty to be overcome. The great advantage in thus reducing the size and weight of the motor is that it can readily be held in the hand and is able in this way to solve the problem of shafting or gearing by doing away with both.

In point of speed this motor is again far in advance of any now on the market, making 15,000 revolutions per minute. Owing to this velocity and power, the instrument is very effective since it eats up the bone with great rapidity and saves much valuable time. On account of the speed of the motor a phrase is used with only one cutting edge which cannot clog. The phrase does not heat as all the heat generated is taken up by the chips. The motor can be used as a drill, as a bur to enlarge a bone cavity, as a phrase to cut an osteoplastic flap, and lastly as a trephine. It will not cut soft tissue. An important surgical point is that this instrument together with its wire connections can be sterilized.

The motor was designed and constructed for Dr. Bryant by the International Instrument Co. of Cambridge, Mass.

* Presented before the Section on Surgery of the New York Academy of Medicine, February 7, 1908.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, March 25, 1908.

The President, Dr. Joseph A. Blake, in the Chair.

LARGE LUMBAR HERNIA TREATED BY SILVER FILIGREE.

Dr. Forbes Hawkes presented a man, 44 years old, who after a nephrectomy done eight years ago, had developed a large lumbar hernia. This had been reduced and a silver wire filigree netting inserted. As the result of a fall this filigree was broken and six months later small pieces of the wire began to extrude; it was finally necessary to remove it entirely. A more flexible silver wire filigree netting was then inserted, and this had now been worn by the patient for over two years with perfect comfort. It seemed probable that one of its strands also had become separated.

Dr. Willy Meyer said he had often resorted to the use of silver wire filigree in dealing with large hernial protrusions with entire success. In his first case, which was operated on in 1901, as well as in many subsequent cases, the filigree had remained in place and was very satisfactory. The method should be limited to those cases with large hernial apertures that could not be otherwise closed.

Dr. Meyer said that in one case where he employed this expedient the wall of a coil of small intestine was accidentally caught in stitching the filigree into place, and the gut finally perforated and a fecal fistula formed. This is the only one in his series in which the filigree had to be removed later. In every other one it staid in place. He feels convinced that the silver wire filigree, whether implanted ready-made or arranged during the operation, will always stay in place and guard against a recurrence of the hernia, if aseptic healing takes place. In case of suppuration, Bier's hyperæmic treatment with the help of cupping

glasses should be given a thorough trial before resorting to the removal of the wire netting.

PAPILLOMATA OF THE BLADDER.

Dr. John F. Erdmann presented a man, 29 years old, who came under his care on November 27, 1906. Eighteen months before, he had noticed, while urinating, that he was passing blood. At certain times it would be almost pure blood; then there were evidences of intermittent bleeding, sometimes just enough to stain the urine, sometimes profound discoloration with clots. There would occasionally be a spasm upon urinating, before the bladder was empty. In the past two months there had been no visible evidence of blood until one week ago, when there was again free hæmaturia. Bloody urine would be induced by jumping on and off cars. He has never had any pain referable to kidney, perineum, bladder or urethra; no thigh nor leg pains. Health otherwise is absolutely perfect. Once he had slight pain in his groin; occasionally has had pain in the lower right side. Never has had any specific disease. He says that the first voiding of blood occurred subsequent to taking a bottle of citrate of magnesia, which was followed by violent catharsis. Urine analysis negative as to kidney cells, casts, etc. He has never had any putrid urine, nor been examined by cystoscope or searchers. No loss of flesh. Voids ample quantity of urine. Cystoscopy showed papilloma of very large size, apparently arising from the right side.

Suprapubic operation was done on Thanksgiving Day, 1906. Upon exposing the interior of the bladder it was found that the papilloma arose from a base of one and a half inches in length, and a quarter inch in width, just above and to the right of the right ureteral orifice. The papilloma itself was one that practically filled the entire bladder, and upon extraction readily filled the hand. Removal was made by means of excision and suture of the gap in the mucosa and submucosa. The patient made a recovery in a period of three to four weeks.

Dr. Erdmann presented a second case, a man 40 years old, who first visited him in September, 1907, and gave a history of occasional bleeding. The urine varied from a slight evidence, by microscope, to very profound evidence of fresh and disintegrated blood. There were no evidences of pain at any time in his history, his attention being called to the trouble by seeing the dis-

coloration of the urine. Cystoscopy showed a papilloma about the size of a filbert near the right ureteral orifice, pedunculated. This was removed on September 23, 1907, and barring a phlebitis, both pelvic and saphenous, his convalescence was without further note, the wound in the bladder having healed in fourteen to sixteen days. The method of removal was suprapubic, grasping the pedicle in the forceps and excision through the mucosa and submucosa, with final suture.

PERINEAL PROSTATECTOMY.

Dr. Charles H. Peck presented a man, 64 years old, who was in good health up to about two years prior to his operation. Since that time he had suffered with increasing frequency of micturition, with tenesmus and a feeling that the bladder had been incompletely emptied. He has been obliged to get up many times at night for months past. One week before operation acute retention developed for the first time. His bladder reached above the umbilicus when first seen by his physician, and about three quarts of urine were withdrawn at one time. When first examined by Dr. Peck on April 10, 1907, the summit of the bladder was above the umbilicus, and more than two quarts of urine were withdrawn by a catheter, which passed easily. Examination by rectum showed marked enlargement of both lateral lobes of the prostate, the upper margin of which could not be reached with the finger. For 24 hours on the 11th and 12th of April sixty ounces of urine were drawn every four hours for nearly the entire day (24 hours), the total being 348 ounces. Patient drank enormous quantities of water. Urine showed a very faint trace of albumin, no sugar, a very few hyaline casts; specific gravity, 1.009; urea, 0.8 per cent. (74½ grams in 24 hours); leucocytes were 14,100, polynuclear cells, 85 per cent.; hæmoglobin, 85 per cent.; red cells, 5,000,000. Patient was extremely stout weighing about 240 pounds; he was slightly cyanotic; no cardiac murmurs; pulse of increased tension, fair quality.

Operation was performed April 13, 1907, under chloroform anæsthesia. A median perineal incision was made, and a Young's tractor passed into the bladder. The rectum was separated from the prostate by blunt dissection, and division of median bands of tissue with scissors. An incision was made through the capsule over the lateral lobe on each side, and six or eight separate

nodules varying in size from a pea to a pecan nut were shelled out with the ungloved finger. Palpation with the finger in each lateral cavity against the retractor in the bladder, and then with the finger in the rectum, demonstrated that the capsule was practically empty; there was no median enlargement. The tractor was then removed and the finger passed through the prostatic urethra to the bladder; there was no obstruction and no stone. A 31 F. sound was passed through the urethra to the bladder and a large perineal drainage-tube inserted and secured. Time of operation, 55 minutes.

The kidneys acted freely after the operation, 240 ounces being passed in 24 hours. The tube was removed and a sound passed on the sixth day. Some elevation of temperature followed, and the tube was replaced four days later and left two days more. On May 7th urine began to pass through the urethra; residual urine about 20 ounces. On May 12th, one month after operation, residual urine was 6 to 8 ounces, and the patient was able to hold his urine from 4 to 6 hours. Sounds were passed every 4 or 5 days. Patient left hospital for his home on May 19th, about 5 weeks after his operation. The perineal wound was nearly closed, but a little urine still escaped. One month later he developed a suppurative phlebitis of right leg, which required incision and drainage, and kept him in bed for some weeks. He now has perfect urinary control; there is still a little moisture at the perineal fistula, but only a drop or two of urine escapes at urination. He is able to retain urine 2 to 4 hours, passing he thinks as much as three-quarters of a pint each time.

The case presented some unusual difficulties; *e.g.*, the great obesity, with poor circulation, and a tendency to cyanosis, increasing the immediate operative and anæsthetic risk; and the high grade of polyuria, which, together with the onset of complete retention, made continuous catheterization impracticable, and operation imperative.

CARCINOMA OF RECTUM TEN YEARS AFTER EXTIRPATION OF ADENOMA OF HEPATIC FLEXURE.

Dr. Howard Lilienthal presented a man of 50 years who was operated on ten years ago for the removal of a tumor of the hepatic flexure which involved the entire ascending colon, part of the transverse colon and six inches of ileum. A resection was

done, and the ileum was anastomosed to the end of the colon by means of a Murphy button. The necessity for the removal of such a large segment of gut was that the ascending cæcum and colon had been drawn up and had become adherent to the adenomatous growth. The patient made an excellent recovery, in spite of his poor general condition at the time of the operation. The excised growth was carefully examined, and proved to be an adenoma.

The patient remained in good health until about one year ago, when he began to complain of pain in the rectum, which was worse on defecation. His stools contained pus and some blood, and there was considerable loss of flesh and strength. Upon examination, Dr. Lilienthal found what he immediately took to be a carcinoma of the anal portion of the rectum, constricting it considerably, and with a number of fissures. A section of the growth removed for microscopic purposes showed adenocarcinoma.

Operation, December 25, 1907. Upon section, the growth was found to extend so high up that it would be impossible to resort to Gersuny's method of twisting the bowel to form a new sphincter after removal of the tumor. The coccyx was removed, and a clamp applied to the rectum about an inch above the tumor; the latter was then pulled down and sewn to the skin, leaving a good-sized opening for drainage. Twelve hours later it was noted that the patient had not passed any urine, and attempts to pass a catheter had failed. This was attributed to accidental injury of the urethra in the course of the operation on the rectum, and before a catheter could be introduced *per urethram* it was found necessary to make a perineal opening pass a catheter from the suprapubic wound through the perineal wound, and insert a sound from the meatus down to the perineal wound. A catheter was then introduced into the bladder through the urethra and left in for ten days. By that time granulations had formed, and the catheter was passed at increasing intervals, and now the patient had no further trouble in passing his urine.

In connection with the rectal operation, Dr. Lilienthal said that in spite of the fact that the ascending colon, part of the transverse colon, and all of his rectum was removed, the patient was still able to hold his stools, although no effort had been made to form a sphincter. By carefully dieting himself and by the

use of subgallate of bismuth, he was able to control his bowels, and had but one passage a day.

CRANIOTOMY FOR TUMOR OF ACOUSTIC NERVE.

DR. WILLY MEYER presented a woman, 23 years old, who was referred to Dr. Meyer by Dr. George W. Jacoby. She had a slight facial palsy on the left side, with drooping of the left eyelid and the corresponding angle of the mouth. She complained chiefly of dizziness and staggering while walking, and swayed on standing. Hearing on the left side was much impaired. There was slight headache; rarely vomiting; choked discs with atrophy.

After careful observation, the case was regarded as one of tumor of the pontocerebellar angle, involving the left auditory and facial nerve, and an operation for its removal was undertaken on January 29, 1908. Preliminary to the operation, the head of the table was elevated, so that the body rested in the inverted Trendelenburg position, with the forehead resting on a special attachment, and hands and feet being supported. Following the suggestion of Dr. Dawbarn, blood was stored in both lower extremities for emergency purposes. Anæsthesia was effected by introducing two long tubes through the nostrils, and administering the anæsthetic through a funnel, a mixture of ether, chloroform, and ethyl chloride being used. In the course of the operation, additional narcotization became necessary, and this was given by means of a mask, with the anæsthetist sitting underneath the operating table. Anæsthesia was very satisfactory throughout.

The occiput was exposed through a large horseshoe incision, extending from one mastoid to the other, and reaching about two fingers' width above the occipital protuberance. This flap was then divided into two equal parts and retracted, thus giving a free exposure of the cerebellar region. After trephining with chisel the bone was removed with the rongeur forceps down to the foramen occipitale, this work being greatly facilitated by first thinning the bone with a large curved chisel. At various points, severe venous hemorrhage was encountered from the divided bone, but this was readily controlled by the application of Horsley's wax. Both lateral sinuses were fully exposed, and at last the bridge of bone in the median line cut through with Gigli saw and removed. Now the dura mater was opened and cut parallel with the border of the divided bone on either side near to the

median line. Here a double ligature was placed around the longitudinal sinus and the latter divided between. A clamp, placed on the distal end, furnished additional security against hemorrhage. Now the entire surface of the cerebellum would be widely exposed. A pronounced bulging of the cerebellum was noted, palpation of which proved negative. An assistant then introduced an angulated brain spatula between the tentorium cerebelli and the cerebellum itself towards the petrous portion of the temporal bone. This was followed by a furious hemorrhage (arterial and venous), filling the deep funnel again and again, in spite of the use of tamponades and the local application of adrenalin solution. Upon quickly removing the tampon from the cavity, it was seen that the hemorrhage came from the tentorium cerebelli from an artery and vein which evidently connected with the pia mater of the cerebellum; these vessels had been torn in spite of the very gentle introduction of the blunt retractor. The hemorrhage was immediately controlled by compression with the gloved finger; the field of operation was perfectly dry. Further exploration then revealed a tumor, bluish-white in color and about the size of a cherry, near the meatus auditorius internus; it was hard to the touch, and comparatively easily shelled out in three pieces. The surrounding brain tissue was soft to the touch. A tampon was left in place to prevent hemorrhage, and a split rubber tube introduced for drainage. The dura mater flap was replaced, but would cover only the lower half of the cerebellum, on account of the acute œdema of the latter. Injury of the bulging brain by the projecting external occipital protuberance was avoided by gauze tamponade of the latter's roughened border.

Subsequent to the operation there was a good deal of oozing of cerebrospinal fluid and for a few days considerable œdema of the face; otherwise recovery was uninterrupted. Gradual improvement in the patient's eyesight and other symptoms had taken place since the operation, which was done eight weeks ago.

Dr. George Woolsey said he had operated three times for the removal of neurofibromata of the acoustic nerve—each time with a fatal result. In the first case the tumor was removed piecemeal, and the patient, although he apparently did well for a time, died of a small hemorrhage which penetrated the pons. In the second case the operation was attempted in two stages, and the patient died after the first stage. In the third case the

operation was also done in two stages. In the second stage, on opening the dura, the cerebellum bulged tremendously, so that it was exceedingly difficult to reach the tumor, which had attained considerable size, being about as large as an English walnut. In all these cases, Dr. Woolsey said, the ease with which the growth could be removed depended a good deal on its size, and his experience had impressed him with the importance of making a good-sized opening in the skull, in order to secure proper access, and to take care of the protrusion of the cerebellum that usually occurred when the dura was opened. He thought that access to these tumors could best be gained by the removal of a considerable part of the lateral lobe of the cerebellum, and this view was also held and practiced by Mr. C. A. Ballance, of London, with whom he had discussed the subject about 2 years ago.

Most of the mechanical contrivances for opening the skull were not very serviceable in operations in this region. If the operation could be done in one stage, that was preferable. The observation of the blood pressure was therefore most important in these cases. The mere relief of intracranial pressure was a most important factor, and that was best accomplished by making a large opening in the skull. This combined with excision of part of the lateral lobe of the cerebellum afforded the best access to the tumor.

Dr. George W. Jacoby said that in view of the frequent occurrence of these tumors, particularly those of the acoustic nerve and of the pontocerebellar angle, cases like that reported by Dr. Willy Meyer were exceedingly instructive, and emphasized the fact that brain surgery was no longer confined, as had been said, to the motor area. In the majority of cases, these tumors involving a special nerve, such as the acoustic, facial or trigeminal, were rather small and easily enucleated. Clinically, we could usually tell whether we were dealing with a primary tumor of the acoustic nerve, or one originating from the pons, medulla or bone. In the case presented by Dr. Meyer there was marked cerebellar gait, with dizziness and almost complete blindness. These symptoms, together with persistent vomiting and headaches, pointed pretty clearly to some growth in the posterior fossa. In addition, there was increasing deafness on one side, with facial paralysis of the peripheral type and the loss of the corneal reflex on the same side indicating involvement of the trigeminal. Upon

these symptoms, the diagnosis of an acoustic nerve tumor was based.

Dr. Charles A. Elsberg said that he personally had had two cases of pontocerebellar acoustic tumors, and in four more cases he had explored the cerebellar region for tumor. In all of his cases the diagnosis of tumor had been made by neurologists. His first patient was operated on in 1905, shortly after Dr. Woolsey had operated on his first case. The patient died on the third day from suppression of urine after the first stage of the operation had been done. The tumor was found in the exact spot where it had been located.

Dr. Elsberg said that after a careful study of these cases he had come to the conclusion that such a wide opening as was advised by Cushing or as was made in the patient shown by Dr. Meyer was unnecessary. If the bone was opened on one side, with free invasion of the corresponding mastoid, a good view of the cerebellum and the pontocerebellar angle could then be obtained by the use of retractors. The speaker said that after working out this method on the cadaver he had learned later that a similar method of approach had been proposed by Krause of Berlin; he had employed it in cutting the auditory nerve in a case of severe tinnitus aurium. The speaker made use of retractors of different sizes, carefully inserted, to draw the cerebellum towards the median line.

In a case which he saw last summer, Dr. Elsberg said, he removed an acoustic nerve tumor about twice the size of an almond. The operation was done in two stages. The patient improved steadily for a time, but ten weeks after the operation he showed symptoms of a recurrence and succumbed suddenly. The postmortem revealed a second tumor—a neuro-fibro-sarcoma lying in the middle fossa, on the base. This second tumor lay in an inaccessible region.

In not a single one of the patients operated upon by the speaker were there any marked respiratory symptoms from pressure on the medulla during the operative manipulations. With a wide opening in the skull and dura and proper care in manipulating the cerebellum, the danger from pressure on the medulla should be a small one. It is neither necessary nor advisable to follow the suggestion of Frazier—*i.e.*, to excise part of the cerebellar lobe in order to expose the cerebellopontine angle.

DR. MEYER, in closing, said the microscopic examination of the growth removed in his case showed fibrosarcoma. The dangers of operation in this region, the speaker said, were largely due to compression of the medulla and pons. By removing a larger section of bone, tying off and dividing the longitudinal sinus and turning down a horseshoe flap of the dura mater, we were in a better position to successfully deal with growths of any size.

CARCINOMA OF THE INNER SIDE OF THE CHEEK, INVOLVING THE ALVEOLAR PROCESS OF THE JAWS AND A PORTION OF THE FLOOR OF THE MOUTH AND HARD PALATE.

DR. L. W. HOTCHKISS presented a man, 52 years old, who was admitted to Bellevue Hospital on January 1, 1908, with an extensive epithelioma of the right cheek and jaws. His previous history was negative as regards venereal disease and traumatism, but he had been an habitual pipe smoker. His trouble had begun about five months previous to his admission, when he noticed a small ulcer of the mucous membrane of the right cheek at a point which was constantly irritated by being caught between his teeth. This ulcer had steadily increased in size and for the past six weeks had begun to be very painful. The entire side of the face was swollen, the pain increased so as to become unbearable, and the skin of the outer surface of the cheek had become adherent and had finally perforated. Trismus was marked, and any attempt at eating was intensely painful. He could swallow only milk and broths, and opiates were necessary to induce sleep. A section of the growth was examined by the pathologist and pronounced an epithelioma. There was moderate glandular involvement in the submaxillary and superior carotid regions, but no evidence of internal metastasis.

Operation, January 20, 1908. This was necessarily a very extensive one. The growth, together with one-half of the lower jaw and the alveolar process of the upper jaw, and a portion of the malar bone and palate, were removed. The large gap left in the cheek was filled by a plastic flap of corresponding size which had been fashioned at the beginning of the operation. The technic of the method would be described in a paper on the subject by Dr. Hotchkiss which would appear later in the ANNALS

of Surgery. The patient's condition had steadily improved since the operation; he was able to work and had gained considerable in flesh and strength.

ACUTE INTESTINAL OBSTRUCTION; ENTEROSTOMY; RESECTION OF COLON.

Dr. F. Kammerer presented a man of 41, who had suffered for three weeks from occasional griping pains in abdomen, vomiting and obstinate constipation. Outside of difficulty in moving his bowels he had not been ill previously, but had noticed a falling off in weight. When he came to the hospital he presented symptoms of subacute obstruction, which became acute on the third day. Paroxysmal intestinal peristalsis was marked in his case. No tumor could be felt. Intestinal peristalsis seemed to cease at the cæcum, although the epigastrium was somewhat distended. An incision was made over the cæcum, when the enormously distended intestines presented themselves. On introducing the hand into the abdomen a constricting tumor was discovered a little below the splenic flexure of the colon. An artificial anus was established at the cæcum. Several weeks later, with an incision on the left side at the outer border of the rectus, the tumor was excised, followed by an end-to-end suture. Finally the artificial anus was closed. The case emphasized the difficulties of localizing the area of obstruction, and the advisability of establishing an artificial anus in cases of great distention, when dealing with the chronic variety of intestinal obstruction.

SYNCHRONOUS LEFT URETEROSTOMY AND RIGHT NEPHROSTOMY FOR HYDRONEPHROSIS, DUE TO URETER OBSTRUCTION BY BLADDER TUMOR; PERMANENT DRAINAGE.

Dr. F. Tilden Brown read this paper and presented the patient upon whom the operation was done.

Dr. R. Hiram Loux, of Philadelphia, said that unfortunately there were a certain number of cases in which some method of draining the kidney must be carried out, either by transplantation of the ureter into the bowel or by some external apparatus. About three or four years ago, Dr. Loux said, he saw a case of recurrent formation of calculi in the calyces of both kidneys. After several operations had been done for their removal the

kidneys became infected and urinary fistulæ formed, necessitating permanent external drainage.

DR. CHARLES H. PECK said that about a year ago he saw a case of complete ureteral obstruction of the right kidney, 48 hours in duration, in a woman whose left kidney had been removed for a partial hydronephrosis. In order to relieve her, a nephrostomy was done and the kidney drained through the cortex. A few days later a ureteral catheter was passed from below, through which the kidney drained perfectly well, but upon its withdrawal the retention recurred. A plastic operation was then done at the junction of the ureter with the pelvis of the kidney but the attempt to re-establish the patency of the ureter failed and a permanent nephrostomy opening had to be left. The urine drained through a rubber catheter which was attached to the thigh. For upwards of a year after this operation the patient remained in good health and was able to attend to her duties. Then she developed some nasal trouble which required operation; this resulted in infection and a fatal meningitis.

BOOK REVIEWS.

ABDOMINAL HERNIA; ITS DIAGNOSIS AND TREATMENT. By W. B. DE GARMO, M.D., New York. Professor of Special Surgery (Hernia), New York Post-Graduate Medical School and Hospital; Fellow New York Academy of Medicine. J. B. Lippincott Company, Philadelphia and London, 1907.

It is to the physician that this book is especially addressed, and it is in order to enable him to diagnose and advise the proper treatment of abdominal hernia that De Garmo has written upon this subject. The work contains an introductory chapter on the surgical anatomy of the inguinal region; there is nothing especially new described here. Inguinal hernia is then taken up, the cause and types are discussed, as well as the symptoms and diagnosis. An important and at the same time unusual chapter is that on the mechanical treatment of inguinal hernia, and it is this which will particularly appeal to the medical practitioner. There are described the various forms of trusses and their mechanism is carefully explained as well as the reasons for failure in some of them. It is interesting to note that it was a medical man who had the honor of having made the most valuable suggestions in the manufacture of the hard rubber truss, with which the names of Riggs, Chase and Hood will always be associated. There follows a chapter on truss-fitting, which most physicians are willing to leave to the truss maker. It is, however, most essential that physicians should understand when a truss fits properly. The physician should be able to write a prescription for a truss as he would for any other kind of treatment. The mechanical treatment of inguinal hernia in infancy and childhood forms another most important chapter. One-half of all the abdominal herniæ occur during the first five years of life, and it is during this period that the defect must be cured if it is ever to be accomplished without operation. It is not a difficult matter and should be thoroughly under the control of the family physician. It is not sufficient for the physician to prescribe a truss for such a patient; he should also regularly inspect the case and make such changes

as are necessary. Dr. De Garmo instructs us in the management of these cases. Works relating to abdominal hernia seldom mention gymnastics as an aid in palliative or curative treatment, but many cases may be improved by their use while others may be enlarged by the improper use of physical exercises. There is an interesting chapter on this subject.

DISEASES OF THE GENITO-URINARY ORGANS AND THE KIDNEY. By ROBERT H. GREENE, M.D., Professor of Genito-Urinary Surgery at the Fordham University, New York; and HARLOW BROOKS, M.D., Assistant Professor of Pathology, University and Bellevue Hospital Medical School. Octavo of 536 pages, profusely illustrated. Philadelphia and London: W. B. Saunders Company, 1907.

The present volume has been compiled conjointly by a surgeon and a physician. It takes up first the general examination of the patient and then the special examinations including the care of urethral instruments and examination of the urine. The chapters on cystoscopy show some advance over other of the more recent publications in that the newer American instruments have been described, directions given for their use and for catheterism of the ureters. There are chapters on the blood in diseases of the kidney, the ocular manifestations of renal disease, the kidney in acute infectious diseases, Bright's disease and uræmia. In reviewing the book as a whole it shows that the medical side of the subject has been more thoroughly discussed than the surgical side; the chapters on Bright's disease, urethritis and prostatitis are more extensive and more comprehensive than are those on the surgery of the kidney and bladder. Why authors should continue to classify tuberculosis of the bladder with cystitis it is difficult to understand; tuberculosis of the bladder is as distinct a lesion as is carcinoma of the bladder, and gives rise to many of the same symptoms. The disease should occupy a chapter by itself, and the importance of early diagnosis should be emphasized. The injection treatment of the disease is the only one advocated. Under the consideration of stone in the bladder, the authors tell us that the symptoms closely resemble those of chronic cystitis; the picture, as a rule, is so different, that the description should not go unchallenged; the pain and suffering in many cases is extreme. Little reference is made to microscopic examination

of the urine, previous history of stone in the kidney, passage of gravel, and so on. For the relief of this condition—in describing the suprapubic operation—a six-inch vertical incision is advised; in many cases this would bring the incision nearly to the umbilicus and wounding of the peritoneum could not well be avoided. For the instruction of the general practitioner, the book is eminently fitted. The writers are conservative and the clinical material from which they have drawn their experience has been extensive.

ATLAS AND TEXT-BOOK OF HUMAN ANATOMY. Volume III. By PROF. J. SOBOTTA, of Würzburg. Edited, with additions, by J. PLAYFAIR MCMURRICH, A.M., Ph.D., Professor of Anatomy at the University of Michigan, Ann Arbor. With 277 illustrations, mostly in colors. W. B. Saunders Company, Philadelphia and London, 1907.

It is impossible, without actually seeing the volume, to appreciate the beauty and exactness of the illustrations which form a most important part of this work. It is safe to say that it is one of the most extensively illustrated works on anatomy ever published. The third and last volume of this Atlas includes the remainder of the vascular system and the entire nervous system together with the organs of the special senses. In many places the veins and nerves or the arteries and veins have been shown in the same illustration, which is a most important feature in view of the necessity of understanding the exact relations of these structures; it has the advantage that the student using the Atlas in the dissecting-room, can find the great majority of structures in the given dissection shown in a single illustration. The chief aim of the author has been to produce a useful book for the medical student and the physician, and although he does not claim that it appeals to the finished anatomist, still it does that to a greater extent than most of the recent works on anatomy. The text matter has been cut down so as to occupy as little space as possible. Volume I treats of the bones, ligaments, joints and muscles: Volume II of the viscera, including the heart: Volume III of the vascular system, lymphatic system, nervous system, and sense organs. As has been stated above, no one can appreciate the character of the book without reviewing it for himself.

A Treatise on Fractures and Dislocations. By Lewis A. Stimson, B.A., M.D., Professor of Surgery in Cornell University Medical College, New York. New (5th) edition, thoroughly revised. Octavo, 847 pages, with 352 engravings and 52 plates. Lea Brothers & Co., Philadelphia and New York, 1907.

This treatise, which is now in its fifth edition, has been repeatedly reviewed in the Annals of Surgery, and it is not necessary to mention again at length the character of the work. It is not the work of a novice for Professor Stimson has been devoting himself to the study of fractures and dislocations for many years, and has gained much experience in the Hudson Street Hospital where the traumatic cases practically include all of the various forms of injury which are described in the treatise. Since the Röntgen rays have been introduced and have afforded a more exact method of studying these lesions than was formerly possible, it has been demonstrated that many fractures which seemed to be satisfactorily reduced and adjusted are, in fact, in very poor position, although the functional result is perfect. Although the medical practitioner is loth to assume the responsibility of a complicated fracture, those who are situated far from the great centres must assume this responsibility however limited may be their experience; to these men, especially, the book of Professor Stimson appeals.

A Text-Book of Minor Surgery. By Edward Milton Foote, A.M., M.D., Instructor in Surgery, College of Physicians and Surgeons, Columbia; Lecturer on Surgery, New York Polyclinic Medical School. 407 illustrations; pp. 713. D. Appleton & Co., New York and London. 1908.

The author in this present work has given to surgical literature a contribution which is notable for its completeness and for the omission of any procedures belonging to major surgery. The book covers those conditions whose description and treatment rarely find sufficient elucidation in Manuals of General Surgery. In reading Dr. Foote's work, one can well imagine a morning spent in a large public clinic such as that of the Vanderbilt or Bellevue.

The author has had a vast experience, indeed, from which to draw information. His teaching he has set forth in a clear,

terse manner, the text being illustrated by frequent apt and instructive cuts—certainly a relief is experienced on noting their originality. To the young physician who has not had the advantages of a hospital or clinical training, the book will be of special value.

The subject matter is classified regionally into seven sections; affections of the head, neck, trunk, genito-urinary organs, anus and rectum, arm and hand, and the leg and foot. In each section a general schematic arrangement is carried out; thus, for affections of the trunk, he discusses in order, *traumatisms,* including contusions, wounds, sprains, fractures, dislocations, *acute inflammations, chronic inflammations; neoplasms,* including cystic tumors, solid benign tumors of trunk, solid tumors of breast, malignant tumors of trunk, and *deformities* acquired and congenital. This outline is, of course, varied in other regions of the body where special affections, such as foreign bodies, burns, amputations, etc., may occur, but all parts are treated fully, concisely and exhaustively.

The book concludes with a section devoted to Minor Surgical Technique, considered in three chapters, namely: Operative Technique, divided into conditions of operation, treatment of the wound, and some typical operations; the Roller Bandage, sub-divided regionally into general considerations, bandages of head, neck and axilla, alone and in combination, trunk, upper extremity and lower extremity; Surgical Dressings, taking up the questions of textile materials, ligatures and sutures, drains, splints and gypsum applications.

Dr. Foote's book is a welcome and valuable contribution to the field of minor surgery, a field which in recent years has been somewhat neglected owing to the wonderful strides made in major surgery.